

A TAXONOMIC REVISION OF *SARCOLOBUS* R. BR. (ASCLEPIADACEAE: MARSDENIEAE) IN AUSTRALIA AND PAPUASIA

Paul I. Forster

Queensland Herbarium, Meiers Road, Indooroopilly, Qld 4068, Australia

Summary

The genus *Sarcobolus* R. Br. is revised for Australia and Papuaasia (Irian Jaya, Papua New Guinea and Solomon Islands). *Astelma* Schltr. and *Papuastelma* Bullock are considered congeneric. Three species occur in Australia, namely *S. ritae* sp. nov., *S. vittatus* sp. nov. and *S. hullsii* comb. nov. (*Marsdenia hullsii* F. Muell. ex Benth.). Nine species occur in Papuaasia including *S. porcatus* sp. nov., *S. spathulatus* sp. nov., *S. vittatus* sp. nov., *S. kaniensis* comb. nov. (*Gymnema kaniense* Schltr.), *S. secamonoides* comb. nov. (*Astelma secamonoides* Schltr.) and *S. brachystephanus* comb. nov. (*Marsdenia brachystephana* Schltr.). Separate keys to the Australian and Papuaasian taxa are given.

Introduction

A monograph of *Sarcobolus* R. Br. was given by Rintz (1980) who recognised four species from Asia, Malesia and Melanesia. All of these species occur in littoral or mangrove habitats. Examination of a wide range of material of Asclepiadaceae from Australia and Papuaasia (Irian Jaya, Papua New Guinea and Solomon Islands) has revealed the existence of additional taxa of *Sarcobolus* from these regions. The genus has diversified considerably in Australia and New Guinea, as the species additional to those described by Rintz, are mainly plants of woodlands or montane rainforests. In most instances the specimens concerned from Papuaasia that I examined, were filed in herbaria as 'Asclepiadaceae indet.', 'Apocynaceae indet.' or under various other genera. Hence it is unlikely that these specimens were examined by Rintz, particularly as large numbers of *Sarcobolus* specimens of the species that he did cover were also present as 'Asclepiadaceae indet.' in a number of herbaria such as A and L where he examined some material.

Generic delimitation in the group of genera closely related to *Sarcobolus* has not previously been satisfactorily resolved. In the Australian and Papuaian region, these genera include *Marsdenia* R. Br., *Gymnema* R. Br., *Stephanotis* Thouars, *Tylophora* R. Br., *Gongronema* Decne., *Bidaria* Endl., *Leichardtia* R. Br. and *Gunnessia* P. Forster (Forster 1990b). Rintz (1980) also discussed *Dorystephania* Warb. and *Pentasachme* Wallich in relation to *Sarcobolus*. I am not familiar with material of the first of these but *Pentasachme* is not related to *Sarcobolus* and belongs to the Stapelieae as defined by Bruyns and Forster (1991).

Several of these genera, namely *Marsdenia*, *Gymnema*, *Tylophora* and *Leichardtia*, were defined by Brown (1810a, b, 1811) on a small number of species and have been added to rather haphazardly by a number of authors, none of whom has attempted to critically examine the overall make-up of the group in terms of the many more species now known. My own studies have concentrated on species from Australia and Papuaasia and to a lesser extent Melanesia, and I have also examined a number of critical taxa from Asia such as the lectotype species of *Marsdenia* (*M. tinctoria* R. Br.), and the type species of *Gongronema* (*G. nepalense* Decne.) and *Bidaria* (*Asclepias tingens* Roxb.). It appears that generic delimitation among these genera has been mainly based on the development of both corolline and staminal coronas and to a lesser extent on corolla form and pollinarium structure. These 'coronas' are fleshy outgrowths that take the form of lobes adnate to the staminal column and may be quite well developed ("staminal corona"), or may take the form of raised ridges with or without hairs and with or without terminal lobes in the corolla throat ("corolline corona").

The earliest two genera recognised, *Marsdenia* and *Gymnema*, have been traditionally distinguished by the presence in the former of a staminal corona and the lack of a corolline corona, and in the latter by the lack of a staminal corona and the presence of a corolline corona. The varying development of these types of coronas may be construed as being selection in relation to co-evolution with pollinators. However, their functional significance is obscure at this point of time. From examination of approximately

75 taxa currently referred to the genera listed above, it is obvious that the degree of development of these coronas cannot be satisfactorily utilised in generic delimitation, but is very useful in defining species and infraspecific taxa. Generic delimitation in *Marsdenia*, including the proposed congeneric *Gymnema*, *Bidaria* and *Leichardtia*, will be discussed in more detail in the revision of the Australian taxa of that group which will be published once the problem of priority of *Stephanotis* over *Marsdenia* is resolved (Forster 1990a). In this paper I will deal only with *Sarcolobus* in any detail and outline how this genus differs from the others in the group mentioned above. At this stage it suffices to state that there is a complete gradation in development of these coronas from those taxa that do not have any coronal development to those that have a well-developed staminal corona, or a well-developed corolline corona or both types of corona. This is particularly noticeable in closely allied taxa such as *Gymnema brevifolium* Benth., *G. trinerve* R. Br., *Marsdenia suaveolens* R. Br. and several recognizable but unnamed taxa. This wide variation in the development of the coronas was previously noted by Rintz (1980) for *Sarcolobus* in his treatment of *S. globosus*. Hence it should be noted that within my concept of *Sarcolobus* there are species that may have either (1) no staminal or corolline coronas, (2) a staminal corona only, (3) a corolline corona only, or (4) both staminal and corolline coronas.

The main distinguishing characters for *Sarcolobus* are the slight to strongly papillate style-head, the narrowly-oblong corpuscles that stand upright away from the anthers and are of similar length or longer than the pollinia, and the geniculate caudicles of the pollinaria. This combination of characters does not occur in related genera such as *Gongronema* (in using the type species *G. nepalense* at least as an example), *Marsdenia s. lat.* (including *Stephanotis*, *Gymnema*, *Bidaria* and *Leichardtia*), *Tylophora* or *Gunnessia* P. Forster. The distinguishing features of these genera are compared in **Table 1**. Rintz (1980) also considered that the shape of the fruit and the presence or absence of a coma on the seeds were of importance in defining *Sarcolobus*. Fruits are still unknown for some of the new taxa from Papuasias described in this paper, so I cannot comment on this character. The presence or absence of a coma on the seeds between different species, also occurs in the unrelated *Cynanchum* L. (Forster 1991). In the species of *Sarcolobus* and *Cynanchum* where a coma is absent, the plants are generally coastal or aquatic inhabitants and the seeds have outer seed coats with well developed lateral margins. It may be inferred that such seeds are adapted to water dispersal but field observations are required to confirm this.

There is little to separate *Gongronema* from *Marsdenia s. lat.* (**Table 1**) so the former may be better included in the latter. The genera compared in **Table 1** may be separated using the following key.

- | | |
|--|------------|
| 1. Corolla depressed-globose; staminal corona comprising a tube completely enclosing the staminal column | Gunnessia |
| Corolla rotate, campanulate, salverform or urceolate; staminal corona absent or of 5 free lobes | 2 |
| 2. Style-head papillate; corpuscles 5 or more times as long as wide | Sarcolobus |
| Style-head smooth; corpuscles less than 5 times as long as wide | 3 |
| 3. Caudicles geniculate | Gongronema |
| Caudicles not geniculate | 4 |
| 4. Pollinia oblong to ellipsoid, held erect to incurved | Marsdenia |
| Pollinia globose to subglobose, held horizontal to semi-erect | Tylophora |

While several of the species enumerated in this account of *Sarcolobus* were previously undescribed, four were described in other genera apart from *Sarcolobus*. The Australian and New Guinean species, *S. hullsii* (F. Muell. ex Benth.) P. Forster was described as a *Marsdenia* species by Bentham (1869), the New Guinean *S. brachystephanus* (Schltr.) P. Forster under *Marsdenia* by Schlechter (1905), the New Guinean *S. kaniensis* (Schltr.) P. Forster under *Gymnema* by Schlechter (1914) and the New Guinean species *S. secamonoides* (Schltr.) P. Forster was described as the only species of the genus *Astelma* by Schlechter (1914). As *Astelma* Schltr. was a later homonym for *Astelma* R.

Table 1. Comparison of some diagnostic floral characters of *Sarcolobus*, *Marsdenia*, *Tylophora*, *Gunnessia* and *Gongronema*

Character	<i>Sarcolobus</i>	<i>Marsdenia</i>	<i>Tylophora</i>	<i>Gunnessia</i>	<i>Gongronema</i>
corolla depressed-globose	-	-	-	+	-
corolla rotate or campanulate	+	+	+	-	+
corolla salverform or urceolate	-	+	-	-	-
staminal corona comprising a tube around staminal column	-	-	-	+	-
staminal corona comprising 5 free & entire lobes fused to base of staminal column	+	+	+	-	+
gynostegium capitate	+	-	+	-	+
corpusculum narrow-oblong, 5 or more times longer than wide	+	-	-	-	-
corpusculum apex held erect and away from the style-head	+	-	-	-	-
pollinia globose to subglobose	+	-	+	+	-
pollinia oblong to ellipsoid	-	+	-	-	+
pollinia erect to incurved	-	+	-	-	+
pollinia horizontal to semi-erect	+	-	+	+	-
caudicles geniculate	+	-	-	+	-

Br. (Asteraceae), Bullock (1964) substituted the name *Papuastelma* and made the combination *P. secamonoides* (Schltr.) Bullock for the species concerned.

In publishing *Astelma*, Schlechter (1914) compared his single species, *A. secamonoides*, to species of *Gymnema*, primarily on its lack of a staminal corona. Schlechter did not comment on the distinctive narrow-oblong corpusculum, nor does his figure show the geniculate nature of the caudicles. *A. secamonoides* cannot be generically separated from the species recognised in *Sarcolobus* either by Rintz (1980) or in the present paper. Hence *Astelma* Schltr. and consequently *Papuastelma* Bullock are placed in the synonymy of the earlier *Sarcolobus* here.

Taxonomic Treatment

Sarcolobus R. Br., *Asclepiad.* 34 (1810). **Type:** *S. banksii* J.A. Schultes

R. Br., *Mem. Wern. Soc. Nat. Hist.* 1: 34 (1811); Wallich, *Pl. As. Rar.* 12: 566, t. 4 & 5 (1818); Schultes, *Syst. Veg.* 6: 58 (1820); Wight, *Contrib. Bot. India* 47 (1834); Schltr., *Bot. Jahrb. Syst.* 50: 159 (1914); Rintz, *Blumea* 26: 65-79 (1980).

Astelma Schltr., *Bot. Jahrb. Syst.* 50: 139 (1914); *Papuastelma* Bullock, *Kew Bull.* 19: 202 (1964), non *Astelma* R. Br. **Type:** *A. secamonoides* Schltr.

Perennial lianes or subshrubs usually with white latex. Stems slender or becoming corky and lenticellate with age, twining or trailing. Roots fibrous. Leaves opposite, flattened in cross-section, coriaceous or herbaceous, margins entire or lobed, glabrous or with indumentum of simple, multicelled trichomes, extrafloral nectaries present at lamina base, petiolate with small stipular structures at base. Cymes appearing at nodes between the pair of leaves, 1-many-flowered. Sepals 5, distinct, usually with glands at base of lobes. Corolla deeply 5-lobed, rotate to campanulate; lobes not contorted in bud. Corolline corona, if present, consisting of 5 ridges in the corolla throat terminating in lobes at the top of the corolla tube. Staminal corona if present, consisting of 5 lobes adnate to staminal column. Stamens inserted at corolla-tube base, connate; anthers each with an incurved terminal appendage. Pollinaria each with 2 pollinia; pollinia semi-erect to horizontal, 2 in each anther theca, globose, oblong or ellipsoid; corpusculum narrow-

oblong, more than 5 times as long as wide, the upper portion usually vertical and standing free from the anthers; caudicles flattened, geniculate. Gynostegium conical to pyramidal; style head enclosed by stamens, papillate, with 5 distinct ridges running down towards corpuscula; ovaries free except for bases and tips, glabrous. Follicles fusiform to ovoid, smooth or somewhat roughened; triangular to semi-quadrate in cross-section, solitary or rarely paired. Seeds flat, ovate or oblong, brown, comose at germinating end only or lacking a coma.

A genus of 13 species in India, Malesia (including Papuasia), Melanesia and Australia. Three species in Australia and eight in Papuasia.

Note: Indumentum cover is as defined by Hewson (1988), except that the term 'scattered' is used instead of 'isolated'.

Key to the species of *Sarcolobus* in Australia

- | | |
|--|-----------------------|
| 1. Leaf lamina elliptic-ovate; inner corolla surface papillate; pollinia globose | 1. <i>S. ritae</i> |
| Leaf lamina lanceolate to ovate; inner corolla surface glabrous; pollinia oblong-globose | 2 |
| 2. Foliage with sparse to dense indumentum; flowers 9–14 mm diameter | 2. <i>S. hullsii</i> |
| Foliage glabrous; flowers 2.6–3 mm diameter | 3. <i>S. vittatus</i> |

1. *Sarcolobus ritae* P. Forster sp. nov. ad *S. hullsium* (F. Muell. ex Benth.) P. Forster affinis, a qua floribus 13–15 mm diam., corolla pagina adaxiali loborum papillata, tubo corollae c. 6 mm diam., columna staminali 1.75–2 mm diam., et polliniis globosis, 0.2–0.28 mm longis differt. **Typus:** Australia, Northern Territory: East Coast road, Murganella area, 11°40'S, 133°08'E, 9 February 1984, D.L. Jones 1356 (holo: DNA).

Liane, latex white. Stems cylindrical, up to 2 mm diameter; internodes up to 25 cm long. Leaves petiolate; lamina elliptic-ovate, up to 12 cm long and 9 cm wide, discolorous; above dark green, venation obscure, glabrous; below pale green, secondary veins 2 or 3 from the base of the midrib, tertiary venation obscure, with sparse indumentum; tip acuminate; base strongly cordate; petiole grooved along top, up to 5 cm long and c. 1 mm wide; extrafloral nectaries 7–14 at base of lamina, occasionally 1 or 2 further up lamina midrib. Cyme comprising 1 or 2 umbelliform fascicles; peduncle up to 20 mm long and 1 mm diameter, with sparse indumentum; bracts ovate c. 1 mm long and 1 mm wide, with sparse indumentum. Flower rotate, strongly scented, c. 4 mm long, 13–15 mm diameter; pedicels 5–12 mm long, c. 1 mm diameter, with scattered to sparse indumentum. Sepals ovate, c. 3 mm long and 2 mm wide, externally with sparse indumentum; base of each sinus with 2 or 3 glands. Corolla black-red or brown; tube c. 1.5 mm long and 6 mm diameter; lobes ovate, reflexed, 5–6 mm long, 4–5 mm wide, with sparse indumentum on edges, upper surface papillate. Corolline corona absent. Staminal corona consisting of 5 lobes adnate to base of staminal column and sunken in corolla throat, c. 1 mm long and 2.5 mm diameter, brown or purplish; each lobe depressed-ovoid, c. 1 mm long and 1 mm wide. Staminal column c. 1 mm long and 2 mm wide; anther appendages ovate, c. 0.5 mm long and 0.5 mm wide; slit between anther wings c. 0.25 mm long, not extending below anthers. Style-head conical, 0.75–1 mm wide. Pollinarium c. 0.3 mm long, 0.5–0.6 mm wide; pollinia globose, 0.22–0.28 mm long, 0.12–0.14 mm wide; corpusculum 0.24–0.25 mm long, 0.05–0.06 mm wide; caudicles geniculate in middle, 0.25–0.3 mm long, 0.02–0.03 mm wide. Follicles and seed not seen. **Figs 1 & 2.**

Specimens examined: Known only from the type collection.

Distribution and habitat: Endemic in the north-eastern end of the Northern Territory (Map 1) where it occurs in seasonally wet open forest communities.

Phenology: Probably flowering from December to March and fruiting several months later.

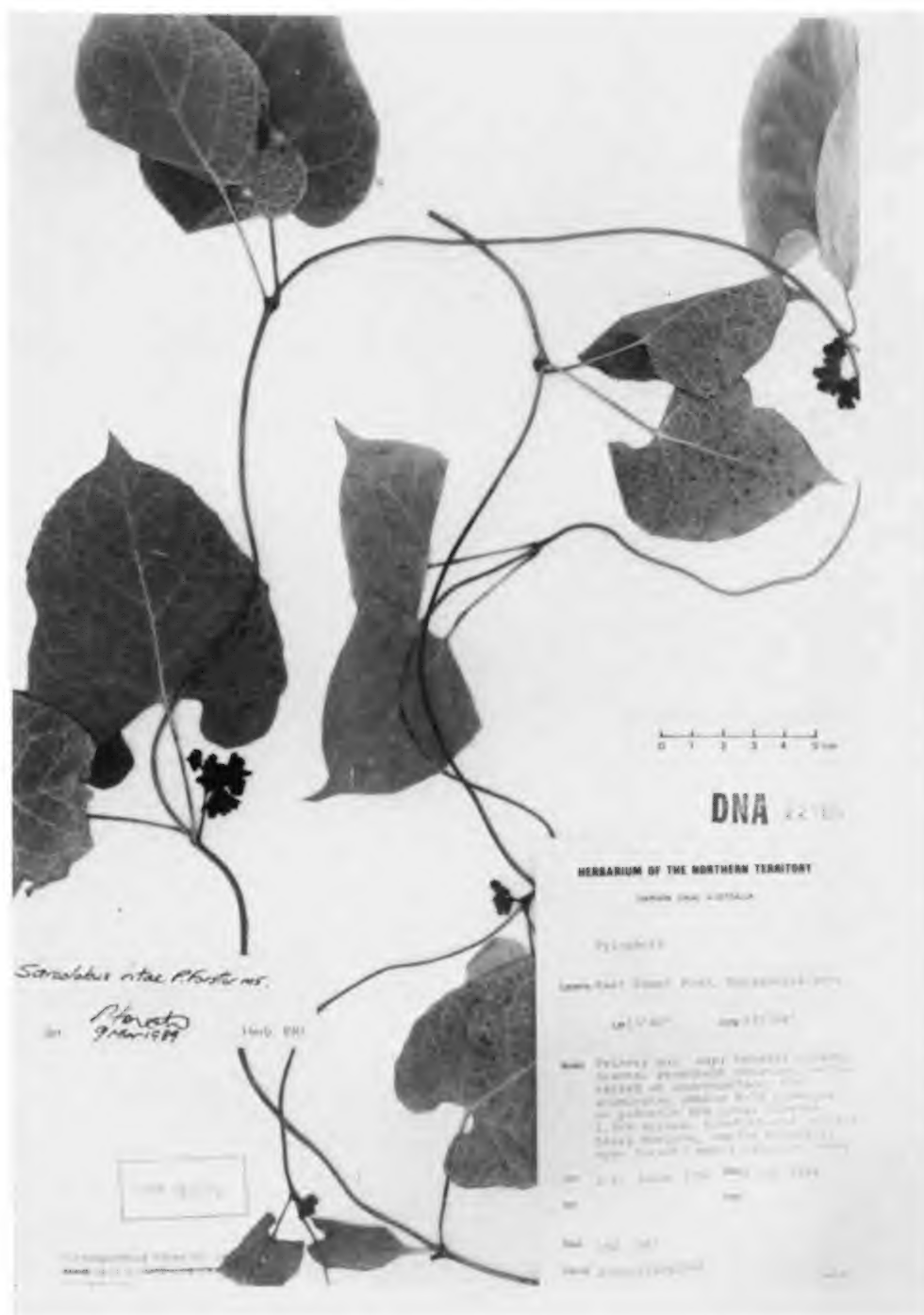


Fig. 1. *Sarcobolus ritae*. Photograph of the holotype (Jones 1356, DNA).

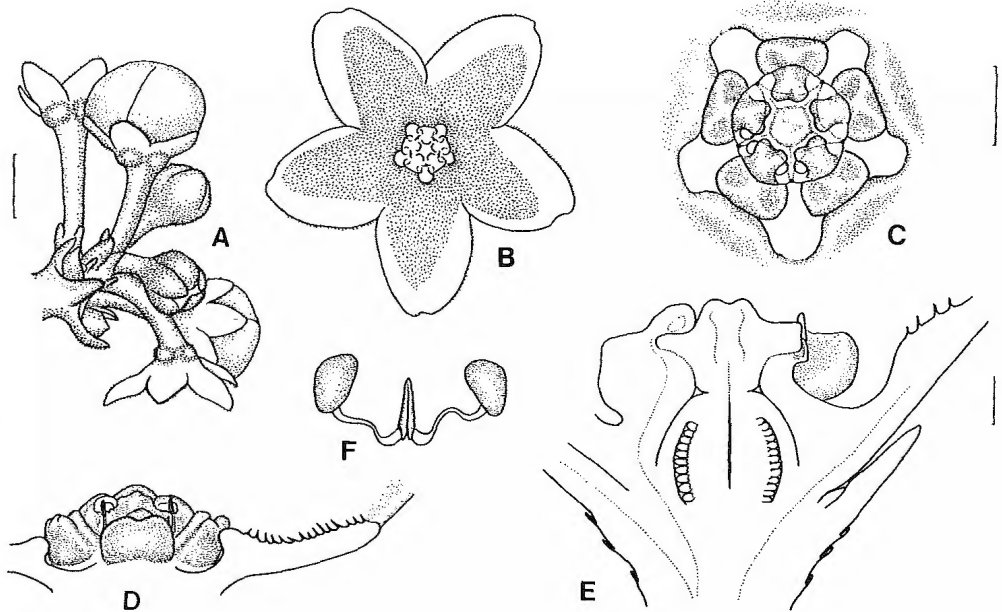


Fig. 2. *Sarcolobus ritae*: A. cyme $\times 2$. B. face view of flower showing papillate area $\times 2$. C. face view of staminal corona and staminal column $\times 8$. D. lateral view of staminal corona and staminal column, and cross-section of corolla showing papillate nature of upper surface $\times 8$. E. lateral cross-section of flower $\times 12$. F. pollinarium $\times 30$. (All from Jones 1356, DNA). Del. P.V. Bruyns.

Notes: This species is very closely allied to *S. hullsii* and both species appear to be more closely related to each other than to the other taxa enumerated by Rintz (1980) or to others described in this paper. *S. ritae* differs from *S. hullsii* in the papillate inner corolla surface, the flowers 13–15 mm in diameter, the corolla tube c. 6 mm in diameter, the staminal column 1.75–2 mm in diameter and the globose pollinia 0.2–0.28 mm in length. Both species appear to be sympatric in the Murganella area.

Conservation status: A coding of 1K (cf. Briggs & Leigh 1988) is appropriate at this stage as further field work is required to ascertain the distribution of this plant in Arnhem Land.

Etymology: Named for Mrs Rita Tingey of Palmerston, Northern Territory, who contributed a number of most useful specimens of asclepiads from the Palmerston/Darwin area in the early days of my research on the family.

2. *Sarcolobus hullsii* (F. Muell. ex Benth.) P. Forster **comb. nov.** *Marsdenia hullsii* F. Muell. ex Benth., Fl. austral. 4: 338 (1869). **Type:** Australia, Northern Territory: Adams Bay, [undated] *Hulls* (holo: K *n.v.*, photo at BRI!; iso: BRI(AQ 333106!), MEL(MEL 113416!)).

Tylophora sp., Jones & Gray, Climbing Pl. Austral. 352, 356 (1988).

Liane, latex white. Stems cylindrical, up to 2 mm diameter; internodes up to 10 cm long, with sparse to dense indumentum in two ridges on opposite sides. Leaves petiolate; lamina lanceolate to ovate, up to 9 cm long and 4 cm wide, discolorous; above green, venation obscure, glabrous; below pale green, secondary veins 4–9 per side of midrib, tertiary venation obscure, with sparse to dense indumentum; tip acuminate; base strongly cordate to truncate; petiole grooved along top, to 2 cm long and c. 1 mm wide, with sparse indumentum; extrafloral nectaries 2–7 at lamina base. Cymes umbelliform to somewhat racemiform, up to 2.5 cm long, 1–many-flowered; peduncle up to 1 cm long, c. 1 mm diameter, with scattered to sparse indumentum; bracts triangular to lanceolate, 0.5–1 mm long, 0.5–0.6 mm wide. Flower rotate, 3–5 mm long, 8–13 mm diameter; pedicels 5–10 mm long, 0.5–1 mm diameter, with scattered to sparse indumentum. Sepals lanceolate to ovate, 2–3 mm long, 1.5–2 mm wide, externally with sparse

indumentum; base of each sinus with 1–3 glands. Corolla mauve to brown inside, green outside; tube 0.75–2 mm long, 2–5 mm diameter; lobes lanceolate to ovate, 3–5 mm long, 3.5–4 mm wide, apex notched, glabrous. Corolline corona absent. Staminal corona cupular and recessed in corolla tube, with 5 separate lobes adnate to staminal column below anthers, 0.5–1 mm long, 1.8–3 mm diameter; each lobe flattened-truncate, 0.5–1 mm long, 0.75–1.1 mm wide. Staminal column 0.8–1 mm long, 1.5–2 mm diameter; anther appendages acute to obtuse, 0.5–0.75 mm long, 0.5–0.7 mm wide; slit between anther wings 0.1–0.2 mm long, not extending below anthers. Style-head conical, flattened, c. 0.75 mm long, 0.75–1.5 mm diameter. Pollinarium c. 0.4 mm long and 0.5 mm wide; pollinia held semi-horizontal to erect, oblong-globose, 0.3–0.5 mm long, 0.15–0.27 mm wide; corpusculum oblong, 0.17–0.25 mm long, 0.06–0.07 mm wide; caudicle geniculate in middle, 0.15–0.27 mm long, 0.02–0.05 mm wide. Ovaries c. 1.5 mm long and 1.5 mm wide. Follicles fusiform-ovoid, 10–13 cm long, 1.5–2 cm wide. Seed ovate, c. 9 mm long and 4 mm wide; coma 25–35 mm long. **Figs 3 & 4.**

Specimens examined: Papua New Guinea. CENTRAL PROVINCE: Eastern footslopes of Tovobada Hills, 12 miles [20 km] N of Port Moresby, May 1965, *Heyligers* 1260 (CANB,L). Australia. Northern Territory. Workshop road, Murganella, 11°30'S, 132°56'E, Feb 1984, *Jones* 1353 (BRI,DNA); Tarracumbi Ck, Melville Is, 11°36'S, 130°43'E, Nov 1989, *Forster* 6095 & *Russell-Smith* (BRI,DNA,QRS); Chingwah Terrace, Palmerston, 12°29'S, 130°58'E, Dec 1987, *Cox* [AQ 459719] (BRI); Holmes Jungle, 12°24'S, 130°56'E, Jan 1988, *Stobo* [AQ 459698] (BRI); 10 miles

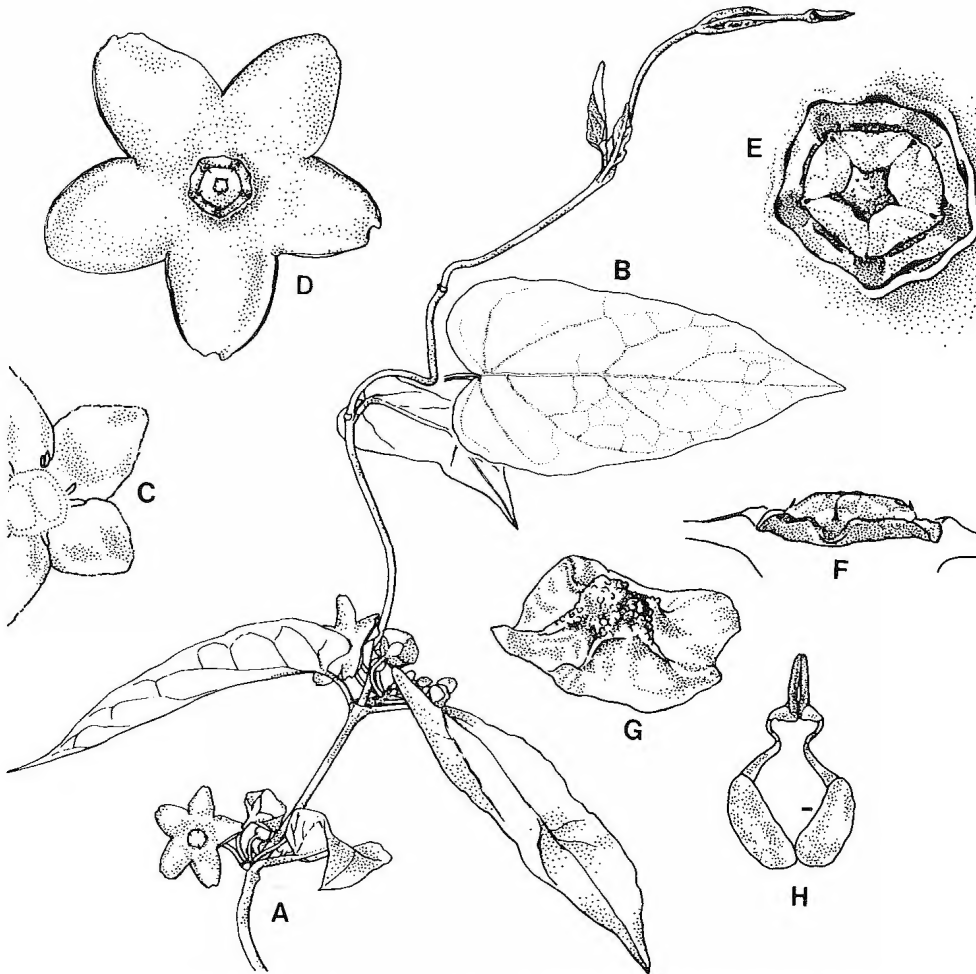


Fig. 3. *Sarcolobus hullsii*: A. habit of flowering shoot $\times 1$. B. leaf $\times 1$. C. face view of calyx showing glands and position of ovaries (stippled) $\times 6$. D. face view of flower $\times 3$. E. face view of staminal corona and staminal column $\times 9$. F. lateral view of staminal corona and staminal column $\times 9$. G. oblique view of style-head, showing 5 ridges and papillate nature $\times 18$. H. pollinarium $\times 37$. (All from Stobo s.n., BRI). Del. K. Harold.

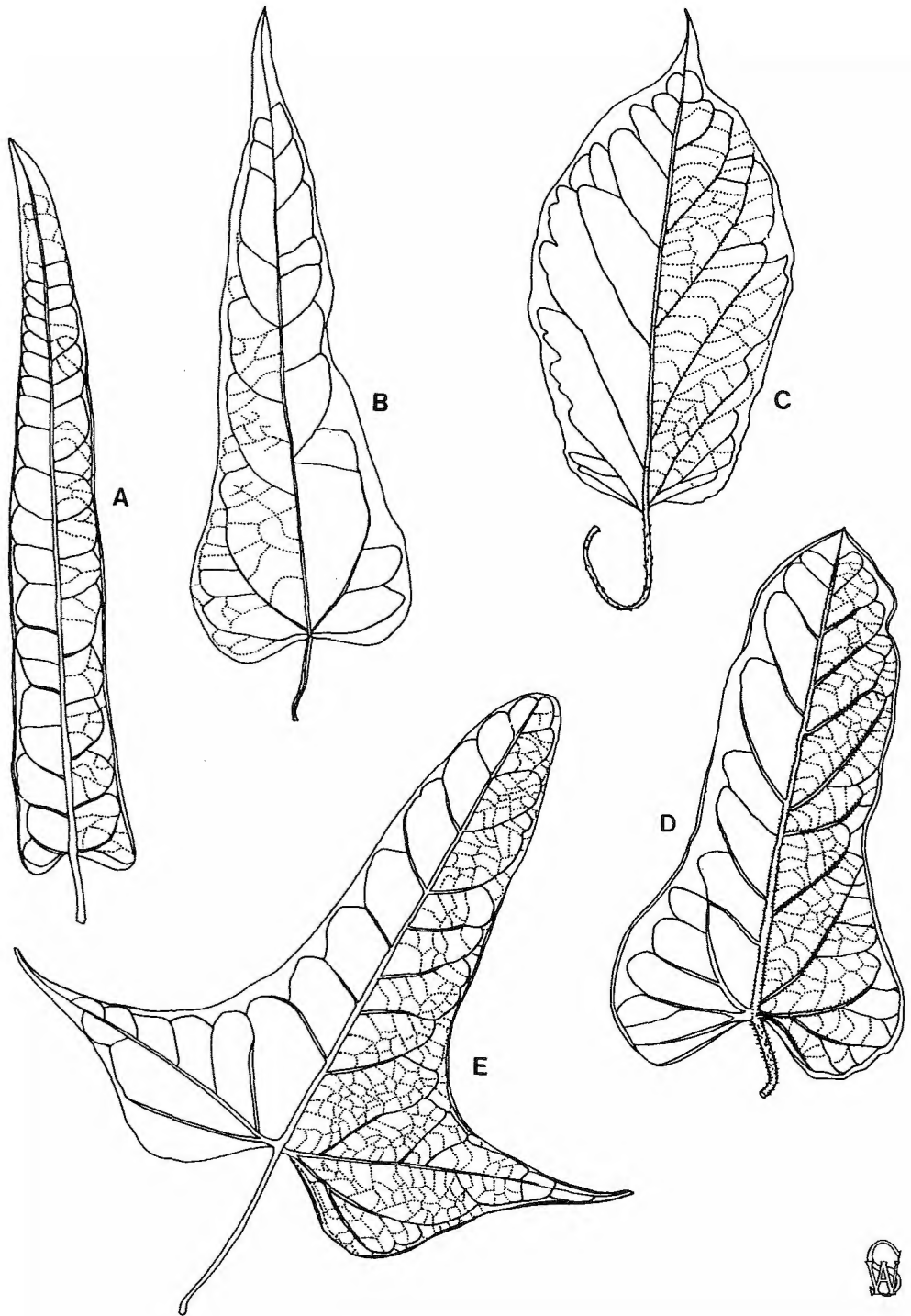


Fig. 4. *Sarcolobus hullsii*: Variation in leaf shape, all $\times 1$. A. Forster 4410. B. Forster 4501. C. Forster 4573. D. Forster 5474. E. Forster 4563. Del. W.A. Smith.

[16 km] NW Humpty Doo, Nov 1971, *McKean* B144 (DNA); 7 km N of Cannon Hill, 12°17'S, 132°52'E, Jan 1984, *Russell-Smith* 956 (DNA); 1 mile [1.7 km] SW of Cannon Hill, Feb 1973, *Martensz & Schodde* AE641 (CANB,DNA); 23 km E Adelaide River Bridge, Arnhem Highway, 12°48'S, 132°32'E, Jan 1984, *Russell-Smith* 940 (DNA); Little Nourlangie Rock, 12°52'S, 132°48'E, Jan 1979, *Dunlop* 5199 (CANB,DNA); Ibangu, creek S end of Ja Ja Massif, 12°33'S, 132°55'E, Feb 1984, *Russell-Smith* 1116 (CANB,DNA). Queensland. COOK DISTRICT: Badu Is, Torres Strait, 10°07'S, 142°07'E, Dec 1976, *Cameron* 2677 (QRS); Kubin Village, Banks (Moa) Is, Torres Strait, 10°10'S, 142°15'E, Aug 1975, *Cameron* 2450 (QRS); 92 km from Bamaga on road south, 11°28'S, 142°27'E, Jun 1988, *Forster* 4488 & *Tucker* (BRI); Bertie Ck, 1 km N of Dulhunty River, 11°50'S, 142°30'E, Jun 1988, *Forster* 4501 & *Tucker* (BRI); Head of Hann Creek, 12°28'S, 142°55'E, Jun 1988, *Forster* 4538 (BRI); ditto, Jun 1989, *Forster* 5474 (BRI); Head of Hann Creek, 46.5 km from Moreton Telegraph Station, 12°29'S, 142°58'E, Jun 1988, *Forster* 4563 (BRI); beach south of Kennedy Hill, 12°29'S, 143°16'E, Jun 1989, *Forster* 5374 (BRI); 60.5 km from Moreton Telegraph Station on Carron Valley road, 12°30'S, 143°05'E, Jun 1988, *Forster* 4573 & *Kenning* (BRI); 41.5 km past Maloney's Springs, 12°30'S, 143°14'E, Jun 1989, *Forster* 5367 (BRI); c. 2 km upstream of Brown Creek Crossing, Iron Range road, 12°46'S, 143°07'E, Apr 1988, *Forster* 4170 & *Liddle* (BRI); 2.6 km past Garraway Creek Crossing, Iron Range road, 12°44'S, 143°11'E, Apr 1988, *Forster* 4184 & *Liddle* (BRI).

Distribution and habitat: This species occurs in southern Papua New Guinea, the northern portion of the Northern Territory and far north Queensland (Map 2) where it grows in open eucalypt forest, woodlands and heaths on sandstone derived soils.

Phenology: Probably flowering from December to March and fruiting several months later.

Notes: Few species of Asclepiadaceae grow in heathland communities in Australia or elsewhere. Vegetative material of *S. hullsii* is superficially similar to that of both *Gunnessia pepo* P. Forster and *Cynanchum leptolepis* (Benth.) Domin, however these species grow in deciduous notophyll vine forest and have more glabrous leaves. One collection (*Forster* 4563 in Figure 4) is notable in the leaves being strongly trilobed which is not only unusual for this species but for Asclepiadaceae in general and parallels the lobing found in some species of *Tweedia* (Rua 1989) or *Ceropegia* (P.V. Bruyns, pers. comm. 1990).

Conservation status: Despite the lack of earlier collections from north Queensland, this is a most common species and is not rare or endangered in any way in Australia.

Ethnobotanical use: The ripe pods of this species may be eaten raw or after cooking by the Gunwing-gu dialect clan in Kakadu National Park, Northern Territory who refer to the species as "anjilat" (Russell-Smith 1985).

3. *Sarcolobus vittatus* P. Forster sp. nov. ad *S. brachystephanum* (Schltr.) P. Forster affinis a qua lobis corollae lanceolato-ovatis, 1.8–2 mm longis, corona corollina lobi parvi terminalibus carenti, et corona staminali nulla, differt. **Typus:** Australia, Queensland, COOK DISTRICT: Unigan Nature Reserve, Weipa, 12°37'S, 141°54'E, 4 March 1990, *P.I. Forster* 6506 & *M.R. O'Reilly* (holo: BRI!; iso: DNA!,L!,QRS!).

Liane, latex white. Stems cylindrical, up to 1 mm diameter; internodes up to 9 cm long, glabrous or with extremely scattered indumentum. Leaves petiolate; lamina lanceolate-ovate, up to 8 cm long and 3.5 cm wide, discoloured; above green, venation obscure, glabrous; below pale green, secondary veins 4 per side of midrib, tertiary venation reticulate, glabrous; tip acute to acuminate; base subcordate; petiole grooved along top, up to 1 cm long and c. 1 mm wide, with scattered to sparse indumentum; extrafloral nectaries 6–9 at base of lamina. Cyme umbelliform to somewhat racemiform, up to 15 mm long; peduncle up to 6 mm long, 1.8–2 mm diameter, with sparse indumentum; bracts triangular-ovate, c. 0.5 mm long, 0.3–0.5 mm wide, with sparse to scattered indumentum. Flower campanulate to urceolate, 2.5–2.8 mm long, 2.6–3 mm diameter; pedicels 1.5–5 mm long, 0.5–1 mm diameter with scattered to sparse indumentum. Sepals ovate, 1.1–1.5 mm long, 1–1.1 mm wide, ciliate, externally with scattered indumentum; base of each sinus with 1 gland. Corolla cream to greenish-yellow; tube 1–1.2 mm long, 2–3 mm diameter; lobes ovate, 1.5–2 mm long and 1.3–1.5 mm wide, glabrous, internally with a pale brown longitudinal stripe in middle. Corolline corona comprising 5 small rounded swellings just below the tube top, glabrous. Staminal corona absent. Staminal column 1.3–2 mm long, 1–1.5 mm diameter; anther appendages truncate, 0.1–0.2 mm long and c. 0.1 mm wide; slit between anther wings 0.1–0.2 mm long, not extending below anthers. Style-head c. 0.6 mm diameter, top slightly raised above anthers. Ovaries 0.6–0.7 mm long, 0.7–0.8 mm wide. Pollinarium 0.25–0.32 mm long, 0.35–0.5 mm wide; pollinia held erect, narrow-globose, 0.17–0.18 mm long, 0.07–0.08 mm wide; corpusculum 0.26–0.32 mm long, 0.05–0.07 mm wide; caudicles 0.29–0.3 mm long, 0.02–0.03 mm wide, geniculate 0.15–0.2 mm from the corpusculum. Follicles and seed not seen. Fig. 5.

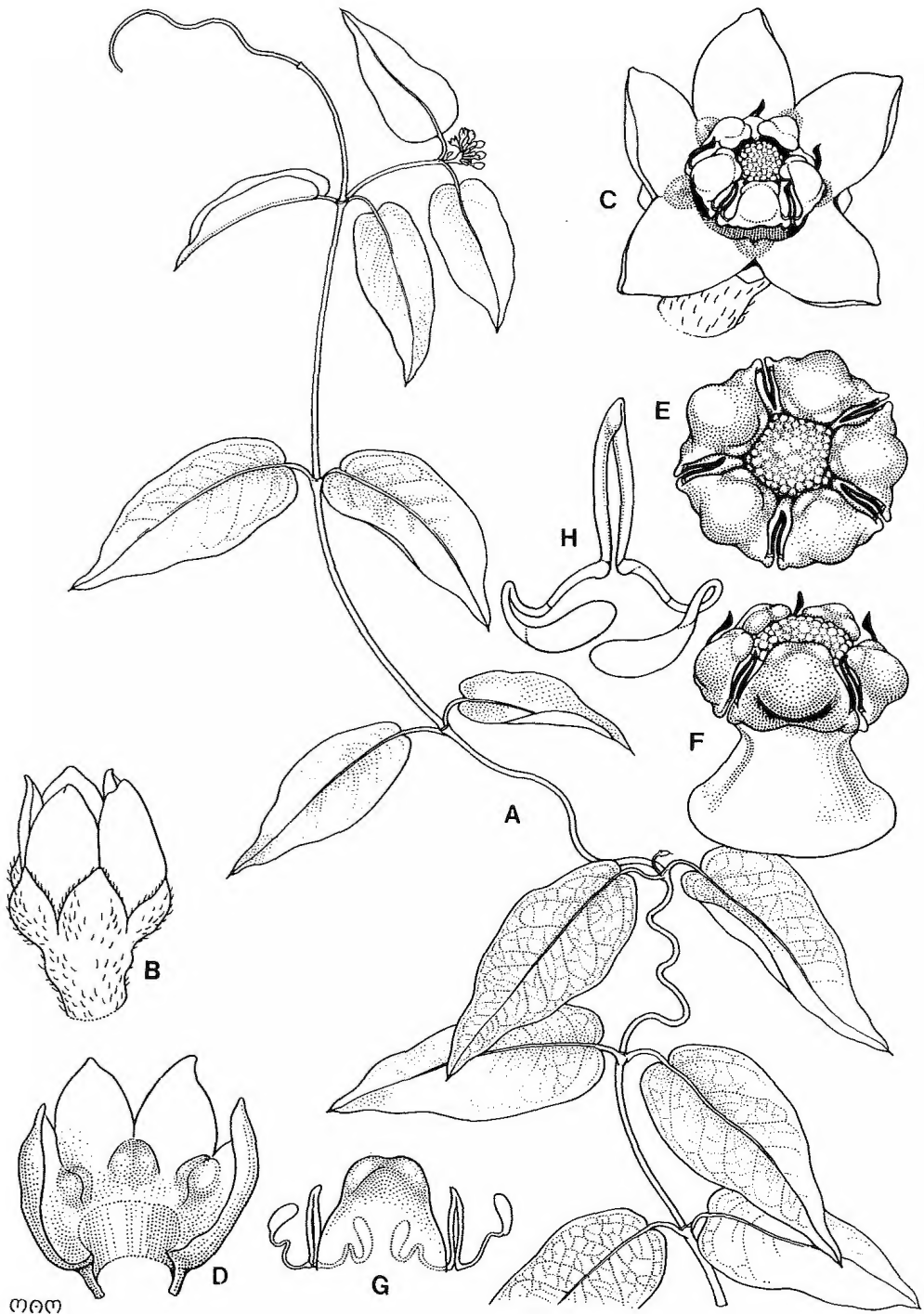


Fig. 5. *Sarcolobus vittatus*: A. habit of flowering branch $\times 0.5$. B. lateral view of flower $\times 10$. C. face view of flower $\times 10$. D. internal view of corolla showing corolline corona $\times 10$. E. face view of staminal column $\times 30$. F. lateral view of staminal column $\times 25$. G. lateral view of style-head showing disposition of pollinaria *in situ* $\times 88$. H. pollinarium $\times 165$. (All from Forster 6506 & O'Reilly), Del. M. Menadue.

Specimens examined: Irian Jaya. Merauke, Nov 1907, *Versteegh* 1886 (L). Papua New Guinea. MOROBE PROVINCE: Coast of Huon Gulf about 5 miles [8.3 km] NE of Lae, Jan 1963, *Hartley* 11079 (BRI,CANB). WESTERN PROVINCE: Upper Wassi Kussa River (left branch), 1939, *Brass* 8624 (A,BRI,L); Daru Island, Apr 1936, *Brass* 6452 (A,BRI,L). GULF PROVINCE: Paia Village near mouth of Omati River, Jan 1955, *Womersley & Simmonds* NGF5062 (BRI). Australia. Queensland. COOK DISTRICT: known only from type collection.

Distribution and habitat: *S. vittatus* occurs in Papua New Guinea and north Queensland (Map 4) in the narrow ecological band between mangroves and the adjoining vegetation.

Notes: *S. vittatus* is closely allied to *S. kaniensis* (Schltr.) P. Forster from New Guinea and differs mainly in the lack of small terminal lobes to the ridges comprising the corolline corona, and the absence of a staminal corona.

Conservation status: It seems remarkable that this taxon has been previously uncollected in Australia. A coding of 2K+ (cf. Briggs & Leigh 1988) is appropriate at this stage until further field work can be undertaken to determine the species abundance and distribution.

Etymology: The specific epithet alludes to the striped nature of the corolla lobes on the type plant.

Key to the species of *Sarcobolus* in Papuaia

- | | |
|---|------------------------------|
| 1. Anther wings extending down staminal column below anthers | 2 |
| Anther wings not extending down staminal column below anthers | 3 |
| 2. Staminal corona present; plant of mountains | 4. <i>S. spathulatus</i> |
| Staminal corona absent; plant of mangroves | 5. <i>S. oblongus</i> |
| 3. Corolline corona present | 4 |
| Corolline corona absent | 7 |
| 4. Corolline corona comprising 5 ridges in corolla throat terminating in 5 small free lobes; plant of mountains | 6. <i>S. brachystephanus</i> |
| Corolline corona comprising 5 ridges or bulges in corolla throat, small free lobes absent | 5 |
| 5. Flowers greater than 6 mm in diameter | 7. <i>S. globosus</i> |
| Flowers less than 5 mm in diameter | 6 |
| 6. Corolline corona comprising five small bulges just below top of corolla tube | 3. <i>S. vittatus</i> |
| Corolline corona comprising five ridges running down length of corolla tube | 8. <i>S. kaniensis</i> |
| 7. Staminal corona absent; plant of mangroves | 9. <i>S. retusus</i> |
| Staminal corona present; plant of mountains or woodlands | 8 |
| 8. Leaf lamina ovate-elliptic; corolla lobes with ridging in centre towards base | 10. <i>S. porcatus</i> |
| Leaf lamina elliptic to lanceolate-ovate; corolla lobes without ridging in centre towards base | 9 |
| 9. Pedicels 5–10 mm long; flowers 8–10 mm diameter | 2. <i>S. hullsii</i> |
| Pedicels 1–4 mm long; flowers 3–4 mm diameter | 11. <i>S. secamonooides</i> |
| 4. <i>Sarcobolus spathulatus</i> P. Forster sp. nov. ad <i>S. secamonoideum</i> (Schltr.) P. Forster affinis, a qua foliis ovato-ellipticis paribus venarum secundariarum 12 vel 13, sepalis c. 1.5 mm longis, et tubo corollae c. 1.5 mm longo differt. Typus: Papua New Guinea. MOROBE PROVINCE: Sattelberg, March 1936, <i>M.S. Clemens</i> 2239 (holo: BRI!; iso: ?A, n.v.). | |

Liane, latex colour unknown. Stems cylindrical, up to 3 mm diameter. Leaves petiolate; lamina ovate-elliptic, up to 8 cm long and 3.5 cm wide, discolorous; above green,

venation obscure, glabrous; below somewhat brownish (dried material), secondary veins 12 or 13 per side of midrib, tertiary venation reticulate, with sparse indumentum on veins and midrib; tip acuminate; base cuneate; petiole up to 1 cm long and 1 mm wide, grooved along top and with sparse indumentum; extrafloral nectaries 8 at base of lamina and also present up to 1 cm along midrib from base. Cyme umbelliform with 1–many flowers; peduncle up to 2 mm long and 1 mm diameter, glabrous; bracts ovate, c. 0.75 mm long and 0.5 mm wide, glabrous. Flowers rotate to subcampanulate, c. 2.5 mm long and 2.5 mm diameter; pedicels c. 2 mm long and 0.5 mm diameter, glabrous. Sepals ovate, c. 1.5 mm long, and 1.5 mm wide, base of each sinus with 1 gland. Corolla yellow; tube c. 1.5 mm long and 2 mm diameter; lobes lanceolate, c. 1.5 mm long and 1 mm wide. Corolline corona absent. Staminal corona comprising 5 lobes adnate to column below and not exceeding the anthers; each lobe oblong-spathulate, c. 0.5 mm long and 0.25 mm wide. Staminal column c. 1 mm long and 1 mm diameter; anther appendages ovate, c. 0.5 mm long and 0.5 mm wide; slit between anther wings c. 0.5 mm long, extending below anthers. Style-head c. 0.5 mm long and 0.5 mm wide. Ovaries c. 1 mm long and 1 mm diameter. Pollinarium c. 0.3 mm long and 0.35 mm wide; pollinia ovoid-globose, c. 0.2 mm long, 0.09–0.12 mm wide; corpusculum narrowly-oblong, 0.3–0.32 mm long and c. 0.06 mm wide; caudicles c. 0.19 mm long and 0.02–0.03 mm wide, geniculate c. 0.12 mm from corpusculum. Follicles and seed not seen. **Fig. 6.**

Specimens examined: Known only from the type collection.

Distribution and habitat: Morobe Province, Papua New Guinea (Map 2). This plant presumably grows in rainforest.

Phenology: Flowering in March.

Notes: This species is distinctive with respect to its spathulate coronal lobes which do not occur in any other species of the genus. *S. spathulatus* is similar to *S. secamonoides*, but differs primarily in the ovate-elliptic leaves with 12 or 13 secondary veins per side of the midrib.

The holotype at BRI is poor and comprises loose leaves and an inflorescence. On the label it is recorded as being a duplicate from A, however I did not find this collection in a loan of material from that institution.

Conservation status: Unknown.

Etymology: The specific epithet alludes to the spathulate coronal lobes.

5. *Sarcobolus oblongus* Rintz, Blumea 26: 77, 78 fig. 4 (1980). Type: Papua New Guinea. WESTERN PROVINCE: Daru Island, along the coast in mangroves, 5 March 1936, L.J. Brass 6278 (holo: A!; iso: BRI!, CANB!). Forster, *Austrobaileya* 3: 123 (1989).

Liane, latex white. Stems cylindrical, up to 10 mm diameter, glabrous; internodes up to 8 cm long. Leaves petiolate; lamina oblong, up to 12.5 cm long and 5.5 cm wide, discolorous; above dark green, glabrous, venation obscure; below pale green, secondary veins 10–15 per side of midrib, tertiary venation obscure, glabrous; tip obtuse-acuminate to mucronate; base cuneate; extrafloral nectaries 6–9 at lamina base; petiole grooved along top, 28–30 mm long, 1–2 mm wide, glabrous. Cyme umbelliform, up to 2 cm long, with 1–8 flowers; peduncle c. 7 mm long and 2 mm diameter, glabrous; bracts lanceolate, c. 5 mm long and 2 mm wide, glabrous or with scattered indumentum. Flowers campanulate, c. 3 mm long, 18–20 mm diameter; pedicels 4–5 mm long, c. 0.8 mm diameter, glabrous. Sepals ovate, c. 4 mm long and 3.5 mm wide, glabrous, ciliate, base of each sinus with 3 or 4 glands. Corolla dark purple; tube c. 4 mm long and 8 mm diameter; lobes lanceolate-ovate, c. 7 mm long, 4.6–5 mm wide, glabrous. Corolline corona consisting of a raised annulus at the top of the tube, c. 0.4 mm high. Staminal corona absent. Staminal column c. 1.8 mm long and 1.7 mm diameter; anther appendages narrow-ovate, c. 0.5 mm long and 1 mm wide; slit between anther wings 0.8–0.9 mm long, extending below anthers. Style-head depressed-globose, c. 1 mm diameter. Ovaries c. 1.2 mm long, 1–1.2 mm wide. Pollinarium c. 0.6 mm long and 1 mm wide; pollinia ellipsoid, 0.3–0.32 mm long, 0.14–0.15 mm wide; corpusculum 0.5–0.51 mm long, 0.1–0.11 mm wide; caudicles 0.4–0.42 mm long, 0.02–0.03 mm wide, geniculate 0.25–0.27

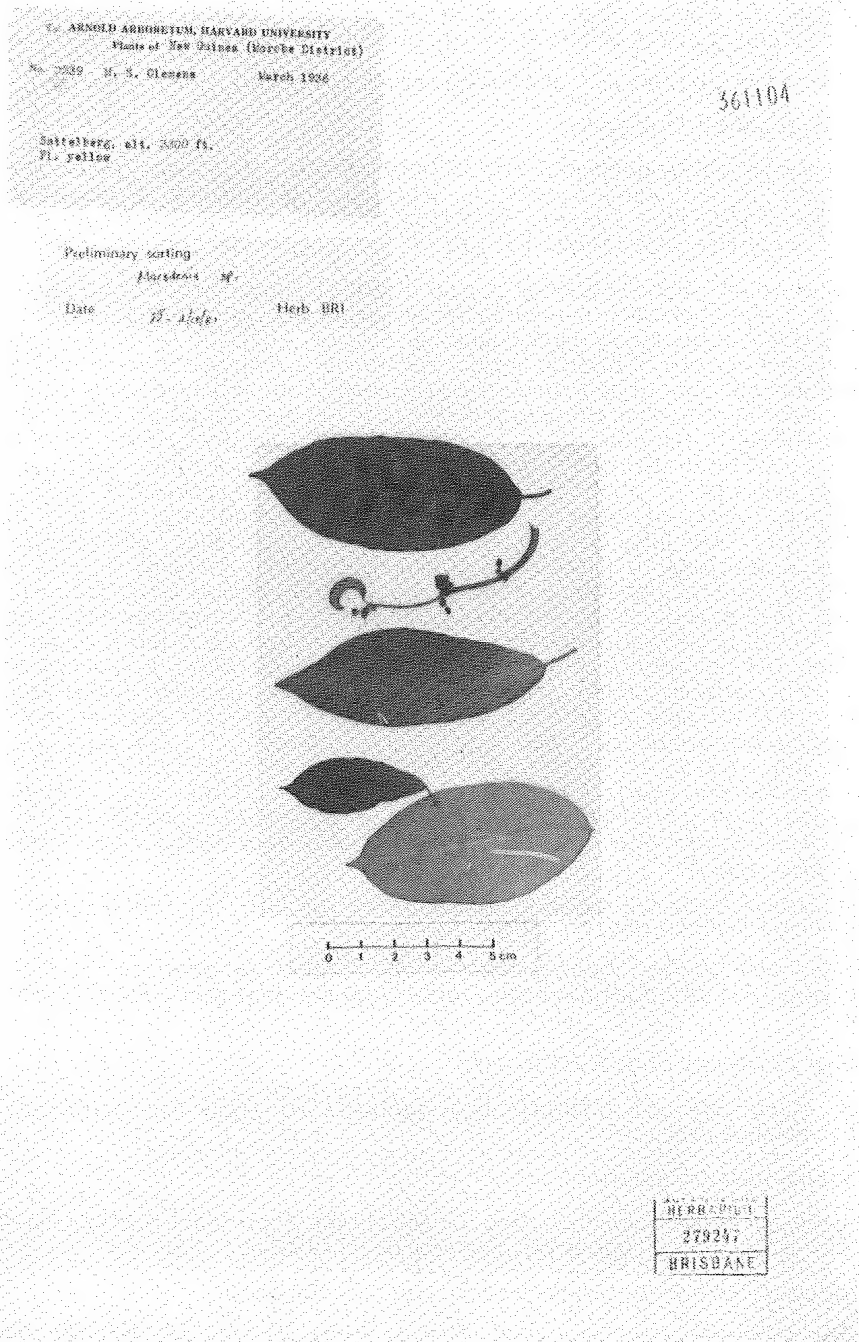


Fig. 6. *Sarcolobus spathulatus*: Photograph of holotype. (Clemens 2239, BRI).

mm from corpusculum. Follicles ovoid, 7.5–8 cm long and 4 cm wide. Seeds oblong, 2–2.5 cm long, 1.3–1.6 cm wide, lacking a coma.

Specimens examined: See Forster (1989).

Distribution and habitat: This species occurs in New Guinea (Rintz 1980) and the Solomon Islands (Forster 1989), where it grows in mangrove communities. **Map 3.**

Phenology: Flowering throughout the year; probably fruiting 3–4 months later.

Conservation status: Unknown.

6. *Sarcolobus brachystephanus* (Schltr.) P. Forster comb. nov. *Marsdenia brachystephana* Schltr. in Schumann & Lauterb., Nachträge fl. Schutzgeb. Südsee 367 (1905). Type: Papua New Guinea. WEST SEPIK PROVINCE: Torricelli Geb., April 1902, R. Schlechter 14386 (holo: B†; iso: P!).

Liane, latex white. Stems cylindrical, up to 3 mm diameter, glabrous; internodes up to 6 cm long. Leaves petiolate; lamina lanceolate-ovate to elliptic, up to 5 cm long and 3 cm wide, discolorous; above green, venation obscure, glabrous; below pale green, secondary veins 7 per side of midrib, tertiary venation reticulate, glabrous or with scattered indumentum; tip acute to acuminate; base cuneate; petiole grooved along top, up to 10 mm long and 0.8 mm wide; extrafloral nectaries 3–7 at base of lamina. Cyme comprising 1 or 2 umbelliform fascicles, up to 1.5 cm long; peduncle greatly reduced or up to 10 mm long and 0.5 mm diameter, with scattered to sparse indumentum; bracts lanceolate, c. 0.5 mm long and 0.2 mm wide, with a few cilia on edge, glabrous or with scattered indumentum. Flower subrotate to campanulate, 1.8–1.9 mm long, 3–4 mm diameter; pedicels 1.5–1.7 mm long, 0.4–0.5 mm diameter, with scattered indumentum. Sepals ovate, 1–1.5 mm long, 1–1.1 mm wide, ciliate, externally glabrous or with scattered indumentum, base of each sinus with 1 gland. Corolla cream; tube glabrous, 0.6–0.8 mm long, 1.8–2 mm diameter; lobes lanceolate-ovate, 1–1.5 mm long, 0.8–1 mm long, glabrous. Corolline corona absent. Staminal column comprising 5 lobes adnate between the anthers and not exceeding them in length; each lobe oblong, c. 0.5 mm long and 0.2 mm wide. Staminal column c. 1 mm long and 1 mm diameter; anther appendages truncate, c. 0.1 mm long and 0.2 mm wide; slit between anther wings 0.3–0.4 mm long, not extending below anthers. Style-head globose-depressed, c. 0.5 mm long and 0.5–0.6 mm diameter. Ovaries c. 0.8 mm long and 0.5 mm wide. Pollinarium 0.32–0.4 mm long, 0.26–0.36 mm wide; pollinia globose-ovoid, 0.2–0.28 mm long, 0.08–0.12 mm wide; corpusculum 0.3–0.34 mm long, 0.07–0.09 mm wide; caudicles 0.13–0.19 mm long, c. 0.01–0.02 mm wide, geniculate 0.09–0.15 mm from corpusculum. Follicles and seed not seen. **Fig. 7.**

Specimens examined: Papua New Guinea. MADANG PROVINCE: Kani Geb., May 1908, Schlechter 17718 (P). MOROBE PROVINCE: Sattleberg, Jun 1937, Clemens 6514 (L).

Distribution and habitat: Madang, Morobe and West Sepik provinces in Papua New Guinea (**Map 3**). Collections have been made from montane rainforest at altitudes of c. 1100 m.

Phenology: Flowering from April to June.

Notes: *S. brachystephanus* is similar to *S. kaniensis* but differs most noticeably in the lack of a corolline corona.

Conservation status: Unknown.

7. *Sarcolobus globosus* Wallich, As. Res. 12: 568 (1818). Type: India. Sundarbans, Wallich 789 (holo: C, *n.v.*, *vide* Rintz, Blumea 26: 73 (1980)).

Only the subsp. *peregrinus* (Blanco) Rintz occurs in Papuaasia.

***Sarcolobus globosus* subsp. *peregrinus* (Blanco) Rintz, Blumea 26: 76, 74 fig. 3 (1980); *Asclepias peregrina* Blanco, Fl. Filip. ed. 2, 207 (1837); *Sarcolobus peregrinus* (Blanco) Schltr., Fedde Rep. 13: 564 (1915). Type:** Philippines, Luzon: Bataan Prov., Limary, Merrill 7477 (neo: NA, *n.v.*, *vide* Schltr., Fedde Rep. 13: 564 (1915)).

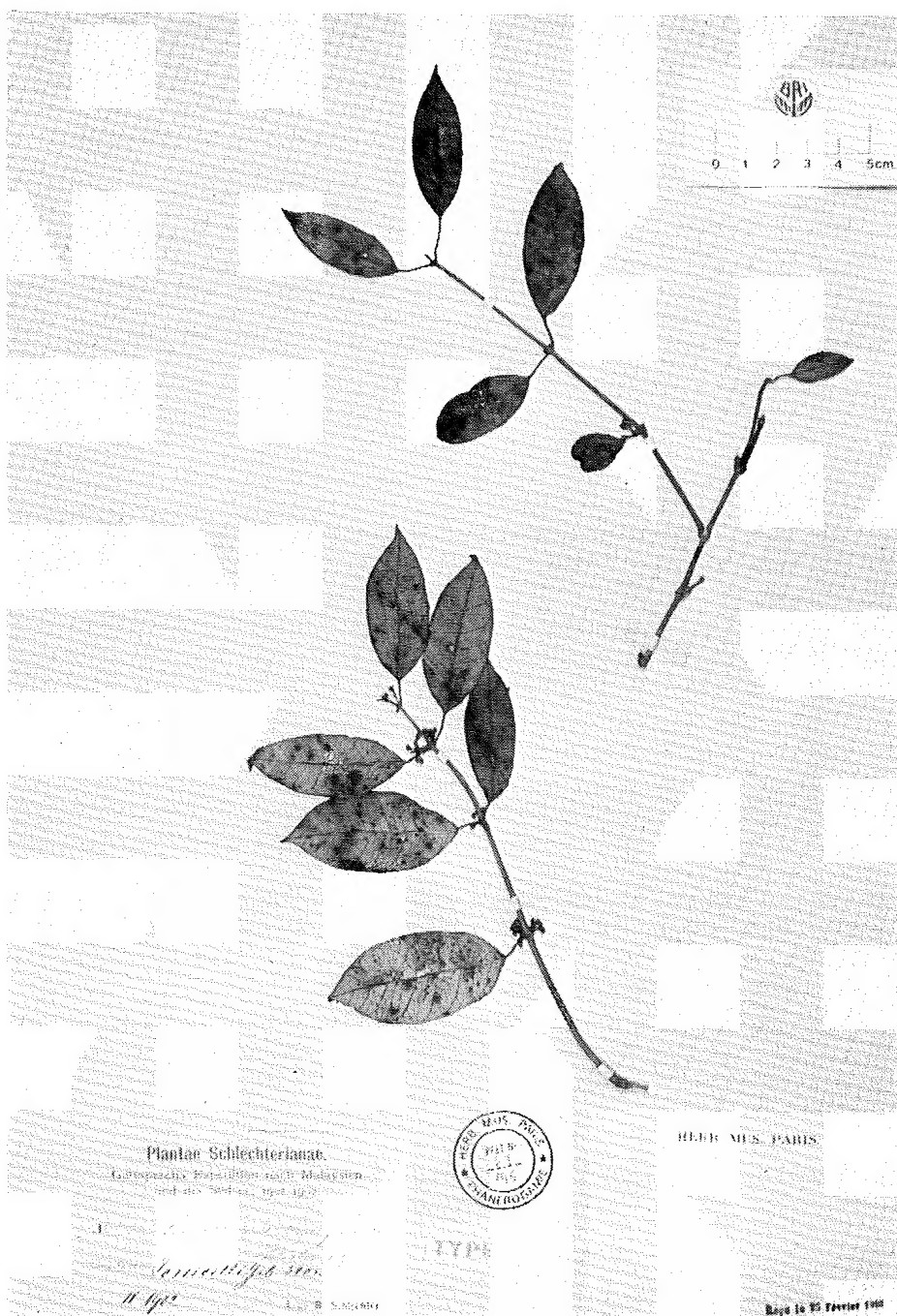


Fig. 7. *Sarcolobus brachystephanus*: Photograph of isotype. (Schlechter 14386, P).

Sarcolobus multiflorus Schumann & Lauterb., Nachträge Fl. Schutzgeb. Südsee 509 (1901). **Type:** Papua New Guinea. MOROBE PROVINCE: Finschhafen, *Lauterbach* 443 (holo: B, n.v., fide Rintz, *Blumea* 26: 76 (1980)).

Sarcolobus beccarii Warb., Fedde Rep. 3: 308 (1907). **Type:** Borneo, Sarawak, *Beccari* 699 (holo: K, n.v., fide Rintz, l.c.).

Sarcolobus minor Schltr., Beih. Bot. Centralbl. 34: 3 (1917). **Type:** Celebes, Toli-Toli, *Schlechter* 20715 (holo: B†).

Liane, latex white. Stems cylindrical, up to 5 mm diameter, with scattered to sparse indumentum; internodes up to 11 cm long. Leaves petiolate; lamina lanceolate-ovate, ovate or elliptic, up to 12 cm long and 5.5 cm wide, discolorous; above dark green, venation obscure, glabrous or with scattered indumentum; below pale green, secondary veins 5 or 6 per side of midrib, tertiary venation reticulate, with scattered indumentum particularly on veins; tip acute, acuminate or obtuse; base cordate to truncate; petiole grooved along top, 22–40 cm long, 0.8–1 mm wide, with scattered indumentum; extrafloral nectaries 18–20 at lamina base. Cyme umbelliform to racemiform, up to 3 cm long; peduncle 7–15 mm long, 0.8–1 mm diameter, with scattered indumentum; bracts lanceolate-ovate, 0.4–0.6 mm long and c. 0.3 mm wide, with scattered to sparse indumentum. Flowers campanulate, 1.6–2 mm long, 12–18 mm diameter; pedicels 8–12 mm long, 0.5–0.6 mm diameter, with scattered indumentum. Sepals lanceolate-ovate, 2–2.2 mm long, c. 1.5 mm wide, glabrous, ciliate, base of each sinus with 1 gland. Corolla yellow-green with red-brown longitudinal stripes on the lobes; tube c. 5 mm long and 10 mm diameter; lobes ovate, 5–5.4 mm long, 6.5–7 mm wide, glabrous or with scattered to sparse indumentum. Corolline corona comprising a raised annulus at the base of the staminal column. Staminal corona comprising 5 lobes adnate to staminal column below anthers; each lobe lanceolate-ovate to oblong, c. 5 mm long and 5 mm wide at base. Staminal column c. 1.8 mm long and 1.8 mm diameter; anther appendages triangular to truncate, c. 0.4 mm long and 0.4 mm wide; slit between anther wings c. 0.6 mm long, extending below anthers. Style-head depressed-globose, c. 0.8 mm diameter. Ovaries c. 1 mm long and 1 mm wide. Pollinarium c. 0.5 mm long and 0.9 mm wide; pollinia narrow-oblong, c. 0.35 mm long, 0.11–0.12 mm wide; corpusculum c. 0.4 mm long and 0.08 mm wide; caudicles 0.56–0.62 mm long, 0.02–0.03 mm wide, geniculate c. 0.4 mm from corpusculum. Follicles globose, c. 10 cm long and 7 cm wide. Seeds oblong, 2–2.6 cm long, 1.5–1.8 cm wide, lacking a coma.

Selected specimens: Papua New Guinea. WESTERN PROVINCE: Oriomo River, 8°50'S, 143°15'E, Jan 1959, *White & Gray* NGF10424 (BRI,L). GULF PROVINCE: 12 miles [20 km] inland from coast, east Purari River delta channel, Feb 1966, *Schodde* 4461 & *Craven* (BRI,L); Paia Village, near mouth of Omati Village, Jan 1955, *Womersley & Simmonds* NGF5061 (A, BRI). CENTRAL PROVINCE: Lower Fly River, east bank opposite Sturt Island, Oct 1936, *Brass* 8131 (BRI,CANB).

Distribution and habitat: This subspecies occurs widely in Malesia and in Western, Gulf and Central Provinces in Papua New Guinea (**Map 2**). Plants grow in mangrove communities.

Phenology: Flowering October to February.

Notes: Rintz (1980) took a broad view of this species with his two subspecies being markedly different in floral structure. As I have not seen material from the region where he claims overlap of characters occurs, no change is made in status for the taxon described here.

Conservation status: Unknown.

8. *Sarcolobus kaniensis* (Schltr.) P. Forster **comb. nov.** *Gymnema kaniense* Schltr., Bot. Jahrb. Syst. 50: 141 (1914). **Type:** Papua New Guinea. MADANG PROVINCE: Kani Geb., October 1907, *R. Schlechter* 16738 (holo: B†).

Liane, latex white. Stems cylindrical, up to 3 mm diameter, glabrous; internodes up to 7 cm long. Leaves petiolate; lamina elliptic to lanceolate-ovate, up to 8.5 cm long and 4 cm wide, discolorous; above dark green, venation obscure, glabrous; below pale green, secondary veins 7 or 8 per side of midrib, tertiary venation obscure, glabrous or with scattered indumentum; tip acute to acuminate; base cuneate to rounded; petiole grooved on top, up to 12 mm long and 1 mm diameter, glabrous or with scattered indumentum; extrafloral nectaries 6–7 at lamina base. Cyme umbelliform, up to 2 cm long, comprising 2 fascicles; peduncle up to 1 mm long and 1 mm diameter, glabrous or with scattered



Fig. 8. *Sarcobolus kaniensis*. (Hartley 9699, CANB).

indumentum; bracts ovate, c. 0.5 mm long and 0.5 mm wide, ciliate. Flower campanulate to subrotate, c. 2 mm long and 3 mm diameter; pedicels 3–4 mm long, 0.3–0.5 mm diameter, glabrous or with scattered indumentum. Sepals ovate, c. 1 mm long and 1 mm wide, ciliate, base of each sinus with 1 gland. Corolla cream; tube c. 1 mm long and 1 mm diameter, glabrous; lobes ovate, c. 1.5 mm long, 1.2–1.25 mm long, glabrous. Corolline corona comprising 5 ridges in the corolla throat alternating with the lobes, each ridge c. 0.2 mm wide and terminating in a small lobe c. 0.1 mm long. Staminal corona comprising 5 lobes adnate to the staminal column; each lobe oblong, c. 0.5 mm long, 0.1–0.2 mm wide. Staminal column c. 0.75 mm long and 1 mm diameter; anther appendages truncate, c. 0.1 mm long and 0.2 mm wide; slit between anther wings c. 0.1 mm long, not extending below anthers. Style-head c. 0.5 mm long and 0.5 mm wide. Ovaries c. 0.5 mm long and 0.5 mm wide. Pollinarium c. 0.35 mm long and 0.35 mm wide; pollinia globose, 0.16–0.2 mm long, 0.06–0.08 mm wide; corpusculum c. 0.3 mm long and 0.07 mm wide; caudicles c. 0.23 mm long and 0.02–0.04 mm wide, geniculate approximately 0.14 mm from corpusculum. Follicles fusiform, 7–7.5 cm long and 3–4 mm wide, glabrous. Seed oblong, 5–6 mm long and 2 mm wide; coma 15–20 mm long, white. **Figs 8 & 10.**

Specimens examined: Papua New Guinea. MOROBE PROVINCE: Along Buko Creek, just S of Gurakor, 6°50'S, 146°38'E, Jan 1962, *Hartley* 9699 (CANB); Buko Creek, 3 miles [5 km] from Gurakor, 7°00'S, 146°40'E, Jan 1962, *Millar* NGF14448 (CANB).

Distribution and habitat: Madang and Morobe provinces in Papua New Guinea (**Map 2**). Collections have been made in rainforest at altitudes of 500–600 m.

Phenology: Flowering in January.

Notes: Although no isotypes of Schlechter's *G. kaniensis* have been located at BM, K, L or P, the species is well illustrated in Figure 8 in Schlechter's (1914) account and the Buko Creek collections seen (**Figs 8 & 9**) are a reasonable match for both Schlechter's figure and original description. Hence I am confident in applying this name to the material cited above.

The foliage of this species is difficult to distinguish from that of both *S. brachystephanus* and an undescribed species of *Marsdenia* collected by C.E. Carr (no. 14781 (CANB)) in southern Papua New Guinea. Any attempts to assign any other vegetatively similar collections should be undertaken only after making a full floral dissection.

Conservation status: Unknown.

9. *Sarcolobus retusus* Schumann in Schumann & Hollrung, Fl. Kais. Wilh. Land 109 (1889). **Type:** Papua New Guinea. MOROBE PROVINCE: Finschhafen, *Hollrung* 2 (iso: K, *n.v.*, *fide* Rintz, *Blumea* 26: 70 (1980)).

Schltr., Bot. Jahrb. Syst. 50: 159 (1914); Rintz, *Blumea* 26: 70, 71 fig. 2 (1980).

Sarcolobus ciliolatus Warb., Bot. Jahrb. Syst. 13: 408 (1891). **Type:** Moluccas, Aroe & Kei Is., *Warburg* 21317 (iso: BRI; A, *n.v.*, *fide* Rintz, *l.c.*)

Tylophora sulphureus Volkens, Bot. Jahrb. Syst. 31: 473 (1902); *Sarcolobus sulphureus* (Volkens) Schltr., Bot. Jahrb. Syst. 50: 160 (1914). **Type:** Caroline Is., *Volkens* 347 (iso: BO, *n.v.*, *fide* Rintz, *l.c.*).

Sarcolobus quinquangularis Schltr., Fedde Rep. 3: 309 (1907). **Type:** Amboina, *Warburg* 17498 (iso: K, *n.v.*, *fide* Rintz, *l.c.*).

Sarcolobus lifuensis Guill., Bull. Soc. Bot. Fr. 74: 929 (1927). **Type:** Loyalty Islands, Lifou, *Balansa* 2405 (holo: P, *n.v.*, *fide* Rintz, *l.c.*).

Liane, latex white. Stems cylindrical, up to 5 mm diameter, with scattered indumentum; internodes up to 10.5 cm long. Leaves petiolate; lamina elliptic, up to 10 cm long and 6.5 cm wide, discolorous; above dark green, venation obscure, glabrous; below pale green, secondary veins 5 or 6 per side of midrib, tertiary venation obscure, glabrous or with scattered indumentum on veins; tip acute, obtuse or mucronate; base cordate, rounded or cuneate; petiole 10–13 mm long and c. 1 mm diameter, with scattered to sparse indumentum; extrafloral nectaries 4–6 at lamina base. Cyme umbelliform to racemiform, up to 2.5 cm long; peduncle 7–8 mm long, 0.8–1 mm diameter, with scattered indumentum; bracts lanceolate-ovate, 0.4–0.5 mm long, 0.2–0.3 mm wide, with scattered indumentum. Flowers campanulate, 2.5–3 mm long, 11–15 mm diameter; pedicels 7–15 mm long, 0.4–0.5 mm diameter, glabrous or with scattered indumentum.

Sepals lanceolate-ovate, c. 2.3 mm long and 1.5 mm wide, glabrous, ciliate, base of each sinus lacking glands. Corolla yellow to brown, sometimes with longitudinal stripes on lobes; tube c. 2.5 mm long and 5 mm diameter; lobes lanceolate-ovate, c. 4 mm long and 3.5 mm wide, glabrous. Corolline corona absent. Staminal column c. 1 mm long and 1 mm diameter; anther appendages ovate to truncate, c. 0.3 mm long and 0.3 mm wide; slit between anther wings c. 0.3 mm long, not extending below anthers. Style-head depressed-globose, c. 0.7 mm diameter. Ovaries c. 1.5 mm long and 1 mm wide. Pollinarium c. 0.4 mm long and 0.5 mm wide; pollinia oblong, 0.2–0.21 mm long, 0.1–0.12 mm wide; corpusculum 0.3–0.35 mm long, 0.08–0.1 mm wide; caudicles 0.25–0.27 mm long, 0.05–0.06 mm wide, geniculate c. 0.15 mm from corpusculum. Follicles ovoid, 5–6 cm long, c. 2.5 cm wide. Seeds ovate, 9–10 mm long, 6–7 mm wide, coma c. 2 cm long, white.

Selected specimens: Philippines. Palawan. St Paul's Bay, Underground River National Park, Sabang Beach, May 1984, *Risdale* SMHI1665 (BRI,CANB). Caroline Islands. Ngerukenid, Belau (Palau), Jan 1988, *Rauleron* 16687 (BRI). Indonesia. Irian Jaya. Pocan Bay, Waigeo Is, Feb 1955, *van Royen* 5512 (A,L). Papua New Guinea. New Ireland: Katu Plantation, 26 miles [43 km] from Kavieng, 2°45'S, 151°06'E, *Coope & Copley* NGF29664 (BRI). NEW BRITAIN: Awul, 6°00'S, 151°02'E, Mar 1965, *Sayers* NGF21996 (BRI); Arawe Plantation, 6°10'S, 149°03'E, Mar 1966, *Henty & Frodin* NGF27258 (BRI). MOROBE PROVINCE: Sisilia River area, 5°29'S, 147°47'E, Sep 1974, *Conn & Katik* LAE66071 (BRI); Buso, 7°20'S, 147°10'E, Jun 1977, *Conn* 174 (L,MEL); Losanga Island, near Kui, 7°30'S, 147°15'E, Apr 1967, *Millar* NGF22842 (BRI,L). MILNE BAY PROVINCE: Wagalasa Island, 8°25'S, 150°30'E, Mar 1969, *Mann & Osborn* NGF43045 (BRI). Solomon Islands. SAN CRISTOBEL: Waimamura, Aug 1932, *Brass* 2562 (A,BRI).

Distribution and habitat: Widely distributed in Malesia. Collections have been made from Irian Jaya, Papua New Guinea and Solomon Islands (Map 1). I have seen no collections from Australia although the species may occur in mangrove communities in north Queensland.

Phenology: Flowering and fruiting throughout the year.

Conservation status: Not endangered or threatened.

10. *Sarcolobus porcatus* P. Forster sp. nov. ad *S. secamonoidem* (Schltr.) P. Forster affinis, a qua foliis ovato-ellipticis, corollis 3–5 mm longis et 5–6 mm diam., corona staminali ex lobis subulatis apicem styli superantibus constanti differt. Typus: Papua New Guinea. MOROBE PROVINCE: Bulolo Valley, 7°10'S, 146°10'E, April 1959, *J. Womersley* NGF11016 (holo: BRI!; iso: CANB!,L!);

Liane, latex colour unknown. Stems cylindrical, up to 4 mm diameter, glabrous or with scattered indumentum; internodes up to 9 cm long. Leaves petiolate; lamina ovate-elliptic, up to 8 cm long and 4 mm wide, discolorous; above dark green, venation obscure, glabrous; below pale green, secondary veins 6–8 per side of midrib, tertiary venation reticulate, glabrous or with scattered to sparse indumentum mainly along veins and midrib; tip acute to acuminate; base rounded; petiole grooved along top, up to 16 mm long and 1 mm wide, with scattered to sparse indumentum; extrafloral nectaries 4–8 at lamina base. Cyme with 4–10 umbelliform fascicles, up to 8 cm long; peduncle 5–20 mm long and 0.7–1 mm diameter, with scattered to sparse indumentum; bracts lanceolate, 0.5–1 mm long, 0.25–0.3 mm wide, with scattered to sparse indumentum. Flower rotate to subcampanulate, 3–5 mm long, 5–8 mm diameter; pedicels 3–6 mm long and c. 0.5 mm diameter, with scattered to sparse indumentum. Sepals ovate, 1.5–1.9 mm long, 1–1.5 mm wide, ciliate, with sparse to dense indumentum externally, base of each sinus with 1 gland. Corolla white to creamy-white; tube 0.9–1.5 mm long, 1.6–3 mm diameter; lobes lanceolate, 2–3 mm long, 1–1.5 mm wide, glabrous, somewhat ridged along centre towards base. Corolline corona absent. Staminal corona c. 1 mm long and 2 mm diameter, comprising 5 lobes adnate to staminal column below the anthers, becoming free and just overtopping style-head; each lobe subulate, 0.5–1 mm long and 0.1–0.25 mm wide. Staminal column 1.4–2 mm long, 1.2–1.5 mm diameter; anther appendages truncate-ovate, 0.3–0.5 mm long, 0.3–0.5 mm wide; slit between anther wings 0.3–0.5 mm long, not extending below anthers. Style-head globose-depressed, 0.5–1 mm diameter. Ovaries c. 1.5 mm long and 1 mm wide. Pollinarium 0.35–0.4 mm long, 0.38–0.45 mm wide; pollinia oblong-ovoid, c. 0.25 mm long and 0.1 mm wide; corpusculum narrow-oblong, 0.35–0.41 mm long, 0.05–0.1 mm wide; caudicles geniculate c. two-thirds along from the point of attachment to the corpusculum, 0.15–0.17 mm long and 0.03–0.04 mm wide. Follicles and seed not seen. Figs 9 & 10.

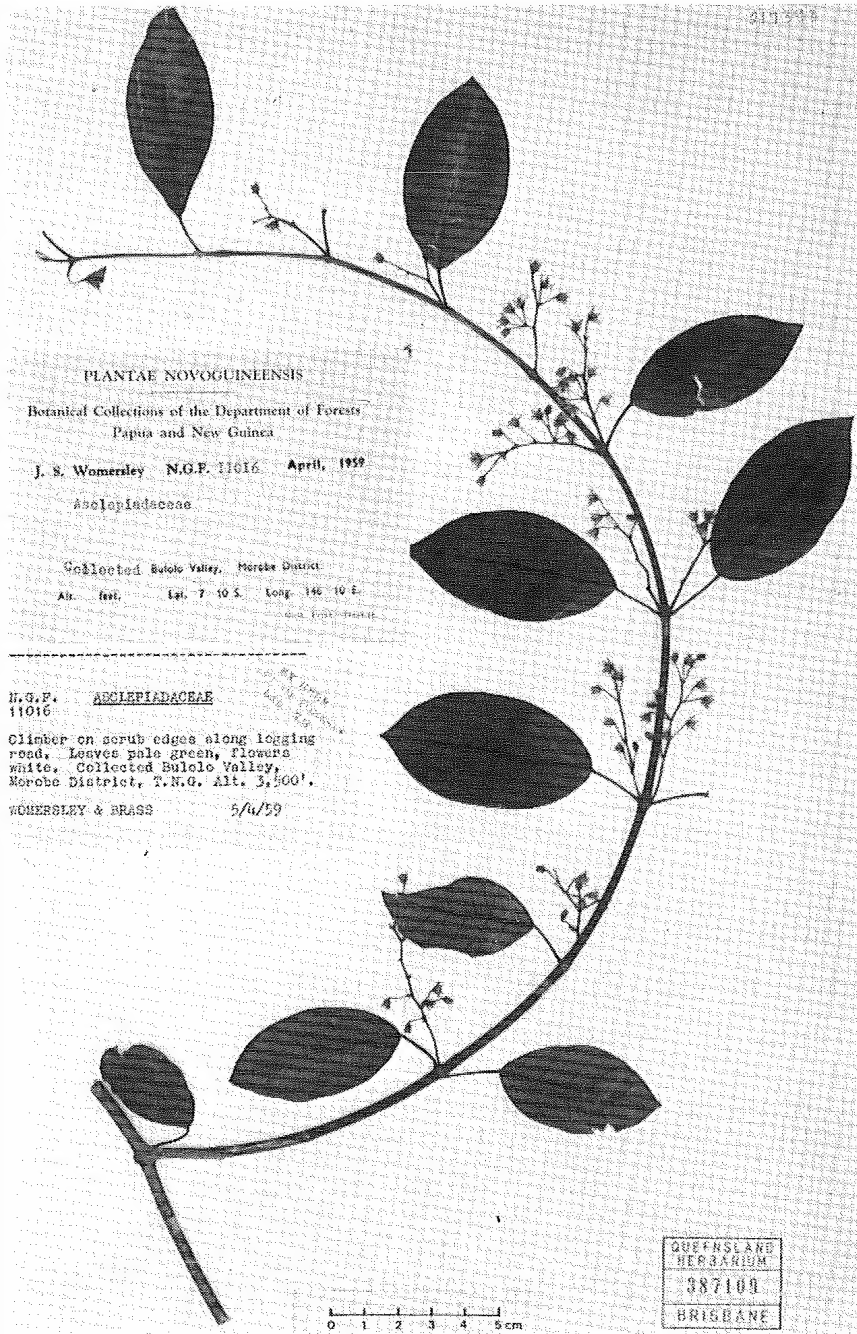


Fig. 9. *Sarcolobus porcatus*: Photograph of holotype. (Womersley NGF11016, BRI).

Specimens examined: Papua New Guinea. MOROBE PROVINCE: Kassam, 6°15'S 146°03'E, May 1967, *Kairo & Streimann* NGF35716 (BRI,CANB,L); Wau, 7°20'S, 146°45'E, Feb 1965, *Sayers* NGF21683 (BRI, L); Clean Water, Wau Forestry, 7°20'S, 146°45'E, Mar 1968, *Streimann & Kairo* NGF35828 (BRI,CANB); Bulolo, Apr 1959, *Brass* 29145 (CANB).

Distribution and habitat: Morobe province in Papua New Guinea (Map 4). This species has been collected from altitudes of 1060 to 1300 m in *Castanopsis* sp. dominated forest. Map 4.

Phenology: Flowering February to May.

Notes: *S. porcatus* is allied to *S. secamonoides* but differs in the ovate-elliptic leaf lamina, the 3–5 mm long and 5–6 mm diameter flowers and the staminal corona of subulate lobes overtopping the style-head.

Conservation status: Unknown.

Etymology: The specific epithet alludes to the *ridged* corolla lobes.

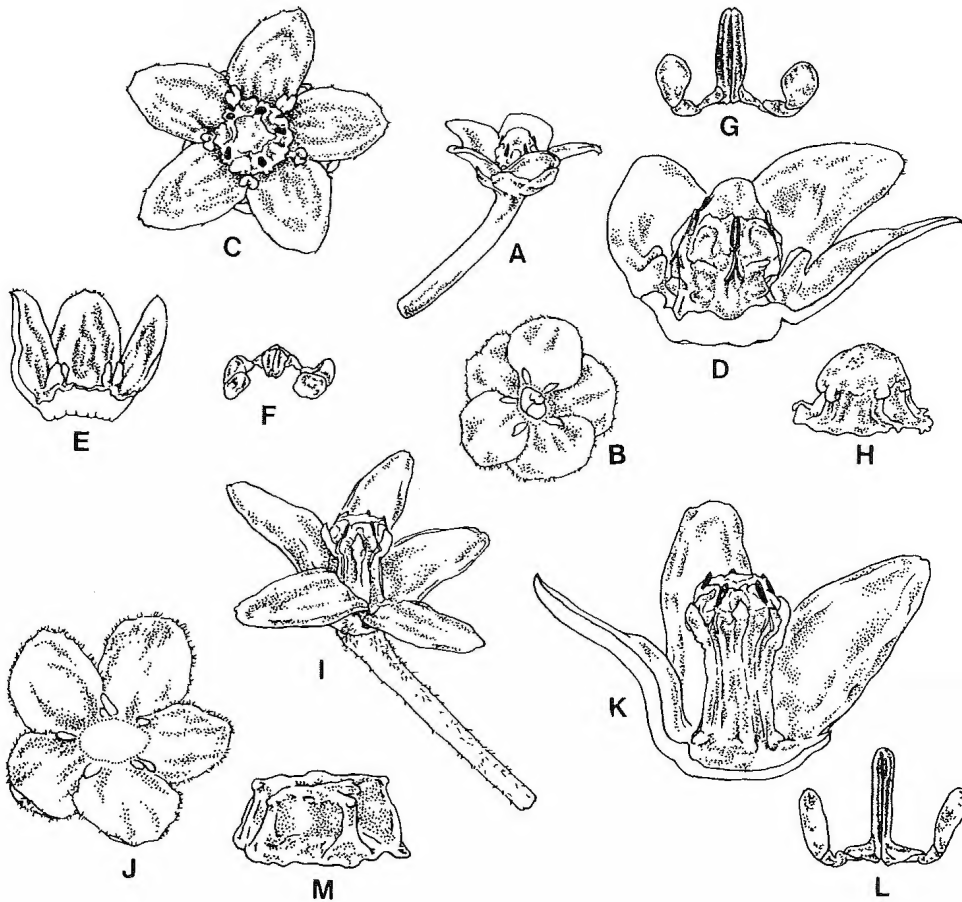


Fig. 10. A–H. *Sarcolobus kaniensis*: A. lateral view of flower $\times 6$. B. face view of calyx showing glands at sinus bases $\times 9$. C. face view of flower $\times 9$. D. lateral view of flower with corolla cutaway showing staminal column and staminal corona $\times 16$. E. internal view of partial corolla showing corolline corona $\times 9$. F. lateral view of pollinarium $\times 40$. G. face view of pollinarium $\times 40$. H. lateral view of style-head $\times 20$. I–M. *Sarcolobus porcatus*: I. lateral view of flower $\times 6$. J. face view of calyx showing glands at sinus bases $\times 9$. K. lateral view of flower with corolla cutaway showing staminal column and staminal corona $\times 9$. L. pollinarium $\times 40$. M. lateral view of style-head (somewhat distorted) $\times 20$. All from reconstituted material: A–H, Millar NGF14448, CANB; I–M, Streimann & Kairo NGF35828, BRI. Del. K. Harold.

11. *Sarcolobus secamonoides* (Schltr.) P. Forster comb. nov. *Astelma secamonoides* Schltr., Bot. Jahrb. Syst. 50: 140 (1914); *Papuastelma secamonoides* (Schltr.) Bullock, Kew Bull. 19: 202 (1964). Type: Papua New Guinea, MADANG PROVINCE: Torricelli Geb., September 1909, R. Schlechter 20051 (holo: B†; iso: K, n.v., photo at BRI!).

Liane, latex white. Stems cylindrical, up to 2 mm diameter, glabrous or with scattered indumentum when young, becoming lenticellate with age; internodes up to 9 cm long. Leaves petiolate; lamina lanceolate-ovate to lanceolate-elliptic, up to 7 cm long and 2.2 cm wide, discolorous; above dark green, venation obscure, glabrous; below pale green, secondary veins 7–12 per side of midrib, tertiary venation reticulate, with scattered indumentum mainly on veins; tip acute; base cuneate; petioles grooved along top, 2–10 mm long and c. 1 mm wide, glabrous or with scattered to sparse indumentum; extrafloral nectaries 1–5 at lamina base. Cymes comprising 1–3 umbelliform fascicles, up to 1.5 cm long, often greatly reduced, usually paired at node; peduncle 0–7 mm long and 0.25–1 mm diameter, glabrous or with scattered to sparse indumentum; bracts triangular to lanceolate, 0.4–0.75 mm long, 0.25–0.5 mm wide, glabrous or with scattered to sparse indumentum. Flowers rotate, sweetly scented, 1.5–3 mm long, 3–4 mm diameter; pedicels 1–4 mm long and 0.25–0.75 mm diameter, glabrous or with scattered indumentum. Sepals ovate, slightly overlapping, 0.75–1 mm long, 0.75–1 mm wide, ciliate, externally with scattered to sparse indumentum, base of each sinus with 1–3 glands. Corolla white, cream or green; tube 0.5–1 mm long, 1.25–2 mm diameter, glabrous; lobes lanceolate-ovate, 1–2.5 mm long, 0.8–1.5 mm wide, glabrous. Corolline corona absent. Staminal corona consisting of 5 very small adnate lobes between the anther wings but not exceeding the anthers in length; each lobe oblong, 0.2–0.5 mm long, 0.1–0.2 mm wide. Staminal column yellow, 0.75–2 mm long, 1–1.5 mm diameter; anther appendages truncate and not exceeding the anthers; slit between anther wings 0.1–0.25 mm long, not extending below anthers. Style-head 0.3–0.5 mm long, 0.5–1 mm diameter, generally not exceeding anthers. Ovaries 1–1.5 mm long and c. 1 mm wide. Pollinarium 0.38–0.45 mm long, 0.35–0.5 mm wide; pollinia oblong-ovoid 0.25–0.35 mm long, 0.08–0.2 mm wide; corpusculum 0.35–0.42 mm long, 0.07–0.08 mm wide; caudicles 0.15–0.25 mm long, 0.02–0.05 mm wide, geniculate approximately in middle. Follicles fusiform, glabrous, c. 47 mm long and 4 mm wide. Seed not seen. Figs 11 & 12.

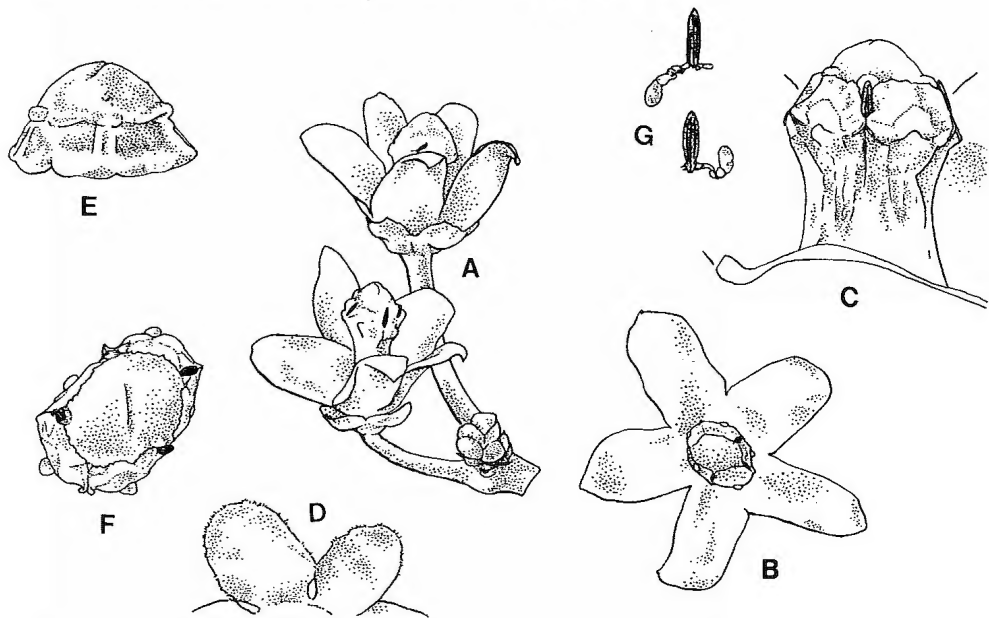


Fig. 11. *Sarcolobus secamonoides*: A. partial cyme with two flowers $\times 27$. B. face view of flower (somewhat distorted) $\times 27$. C. lateral view of staminal corona and staminal column $\times 63$. D. face view of calyx with corolla removed $\times 42$. E. lateral view of style-head (faintly papillate) $\times 73$. F. face view of staminal corona and staminal column (somewhat distorted) $\times 63$. G. pollinarium $\times 73$. All from reconstituted material of Vink 16397, BRI. Del. K. Harold.



Fig. 12. *Sarcolobus secamonoides*. (Womersley NGF11425, BRI).

Specimens examined: Papua New Guinea. EAST SEPIK PROVINCE: Etappenberg, Oct 1912, *Ledermann* 9459 (L). WESTERN HIGHLANDS PROVINCE: Kubor Range, Uinba, Nona-Minj Divide, Aug 1963, *Vink* 16397 (CANB). EASTERN HIGHLANDS PROVINCE: Kini Creek, NE slopes of Mt Michael, 6°25'S, 145°20'E, Sep 1959, *Womersley* NGF11425 (BRI,CANB); Mt Michael, northeast slopes, Sep 1959, *Brass* 31338, 31529 (CANB). MADANG PROVINCE: N Kalronk Valley, Aug 1964, *Bulmer* 207 (LAE). MOROBE PROVINCE: track, Angabena ridge – Aseki, 7°20'S, 146°10'E, *Streimann & Stevens* LAE53999 (BRI,CANB,L); Kisingam, Mt Dilmargi, 6°20'S, 146°35'E, Dec 1972, *Stevens* LAE58027 (BRI,CANB); New Yamap, head of Baime River, 7°05'S, 146°50'E, Dec 1969, *Streimann & Kairo* NGF44462 (BRI,CANB); Matap, Feb-Apr 1940, *Clemens* 40932 (BRI); Ogeram nang, Jan 1937, *Clemens* 5062 (BRI); Sambangan, Aug 1937, *Clemens* 6779 (L); Samanzing, Oct 1938, *Clemens* 9728A (L). CENTRAL PROVINCE: Efogi environs, Owen Stanley Range, Sep 1970, *Schodde* 5704 (BRI,CANB); Isuarava, 8°59'S, 147°43'E, Feb 1936, *Carr* 15325, 15459 (CANB).

Distribution and habitat: *S. secamonoides* is widely distributed in Papua New Guinea (Map 1) where it grows in montane primary or secondary forest often dominated by *Nothofagus* species at altitudes of 1490 to 2000 m.

Phenology: Flowering throughout the year.

Notes: *S. secamonoides* is similar to *S. spathulatus* but differs most noticeably in the lanceolate-ovate to lanceolate-elliptic leaves with 7–12 secondary veins per side of the midrib.

Conservation status: Unknown.

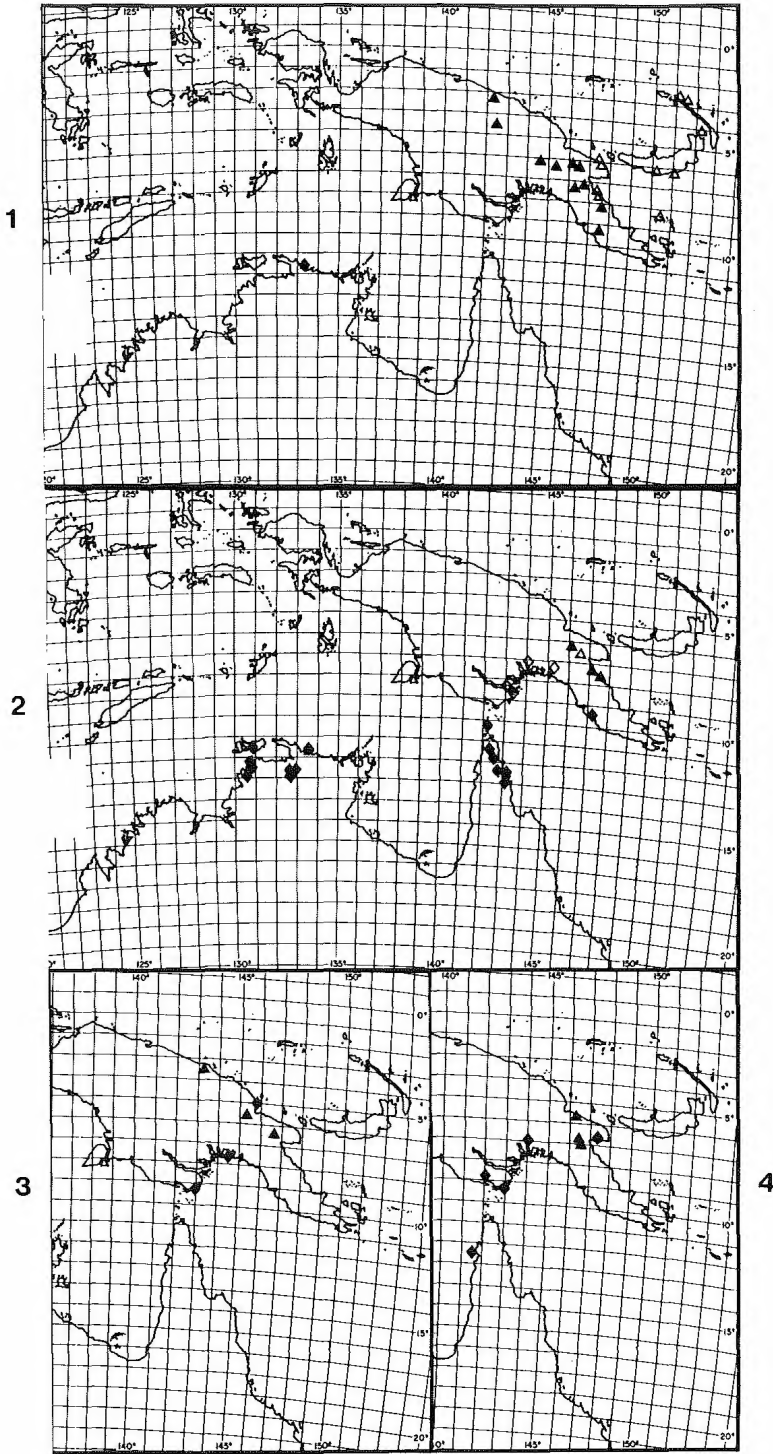
Ethnobotanical use: The label of *Bulmer* 207 records that this species is used for fencing and home building and was known as “Wogukesinlk”.

Acknowledgements

Illustrations were drawn by P.V. Bruyns, K. Harold, M. Menadue and W. Smith. Material was collected on trips undertaken with P.D. Bostock, G. Kenning, D.J. Liddle, M.R. O'Reilly, J. Russell-Smith and M.C. Tucker. The latin diagnoses were translated by A.S. George. B. Leuenberger (B) provided a list of Schlechter collections held at that institution. P.V. Bruyns (BOL) commented on a draft of the manuscript. G.P. Guymer (BRI), K.L. Wilson (NSW) and T. Macfarlane (PERTH) while Australian Botanical Liaison Officers at Kew, England, located and photographed various types. P.R. Sharpe translated parts of Schlechter's various papers. The Directors/Curators of the cited herbaria allowed access to the collections at their institutions or on loan. Staff of the Queensland Herbarium arranged and processed loan material. The Australian Biological Resources Study provided funding during 1988 to 1990. All of this assistance is gratefully acknowledged.

References

- BENTHAM, G. (1869). Asclepiadeae. *Flora Australiensis* 4: 324–348. London: L. Reeve & Company.
- BRIGGS, J.D. & LEIGH, J.H. (1988). Rare or Threatened Australian Plants. 1988 Revised Edition, Australian National Parks and Wildlife Service, Special Publication No. 14. Canberra: Australian National Parks and Wildlife Service.
- BROWN, R. (1810a). *Prodromus Florae Novae Hollandiae et Insulae van Diemen*. New York: J. Cramer.
- BROWN, R. (1810b). On the Asclepiadeae. [a natural order of plants separated from the Apocineae of Jussieu]. London: R. Brown. [A preprint of Brown 1811].
- BROWN, R. (1811). On the Asclepiadeae, a natural order of plants separated from the Apocineae of Jussieu. *Memoirs of the Wernerian Natural History Society* 1:12–78.
- BRUYNS, P.V. & FORSTER, P.I. (1991). Recircumscription of the Stapeliceae (Asclepiadaceae). *Taxon* in press.
- BULLOCK, A.A. (1964). Nomenclatural notes: XVI. *Kew Bulletin* 19: 199–204.
- FORSTER, P.I. (1989). Notes on Asclepiadaceae, 1. *Austrobaileya* 3: 109–133.
- FORSTER, P.I. (1990a). Proposal to conserve *Marsdenia* R. Br. against *Stephanotis* Thouars (Asclepiadaceae). *Taxon* 39: 364–367.
- FORSTER, P.I. (1990b). Notes on Asclepiadaceae, 2. *Austrobaileya* 3: 273–289.
- FORSTER, P.I. (1991). A taxonomic revision of *Cynanchum* L. (Asclepiadaceae: Asclepiadoideae) in Australia. *Austrobaileya* 3: 443–466.
- HEWSON, H.J. (1988). *Plant Indumentum. A Handbook of Terminology*. Australian Flora and Fauna Series No. 9. Canberra: Australian Government Publishing Service.



Maps 1-4: Distribution of *Sarcobolus* spp.: 1. *S. retusus* \triangle ; *S. secamonoides* \blacktriangle ; *S. ritae* \blacklozenge . 2. *S. spathulatus* \triangle ; *S. kaniensis* \blacktriangle ; *S. globosus* subsp. *peregrinus* \diamond ; *S. hullsii* \blacklozenge . 3. *S. brachystephanus* \blacktriangle ; *S. oblongus* \diamond . 4. *S. porcatus* \blacktriangle ; *S. vittatus* \blacklozenge .

- RINTZ, R.E. (1980). A revision of the genus *Sarcolobus* (Asclepiadaceae). *Blumea* 26: 65–79.
- RUA, G.H. (1989). Revision taxonomica del genero *Tweedia* (Asclepiadaceae). *Parodiana* 5: 375–410.
- RUSSELL-SMITH, J. (1985). Studies in the jungle: people, fire and monsoon forest. In R. Jones (ed.), *Archeological Research in Kakadu National Park* 241–268. Canberra: Australian National Parks & Wildlife Service, Special Publication No. 13.
- SCHLECHTER, R. (1905). Periplocaceae, Asclepiadaceae. In K. Schumann & K. Lauterbach (eds), *Nachträge zur Flora der Deutschen Schutzgebiete in der Südsee*. 351–369. Leipzig: Gebrüder Bornträger.
- SCHLECHTER, R. (1914). Die Asclepiadaceen von Deutsch-Neu-Guinea. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 50: 81–164.

Accepted for publication 25 February 1991